Railway Maintenance Engineer

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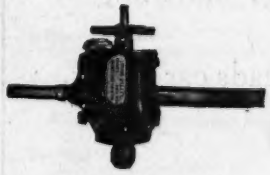
"Little David" Pneumatic Tools Are Now a Part of the Maintenance of Way Department's Standard Repair Kit

The repair and maintenance of steel bridges and other structures calls for sturdy and speedy tools that do not fail on the job.

"Little David" Riveter

On account of their rugged construction, "Little David" Tools are as nearly trouble proof as can be made. They have less parts to wear or break.



"Little David" Drill

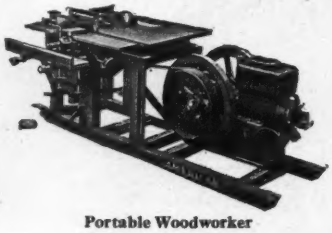
The "Imperial" Tie Tamper Compressor Car is a handy and reliable source of air power for operating "Little David" Air Tools on all classes of Maintenance work.

Ingersoll-Rand Company

General Offices: 11 Broadway, New York

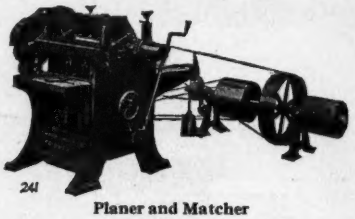
Ingersoll-Rand

206-PT



Portable Woodworker

AMERICAN
Cost Cutters



Planer and Matcher

Five AMERICAN Machines which speed up the work, save waste, and earn dividends.

Ask for catalog describing these and many other labor saving machines.

New Lumber From Old Timbers

AMERICAN Portable Sawmill

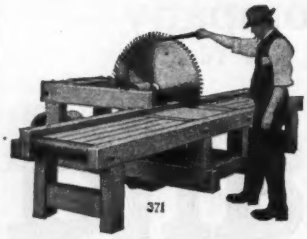
AMERICAN Saw Mills, for the economical manufacture of lumber and ties from logs, old timbers, piles, etc., or for reducing heavy timbers to smaller dimensions.

Heavy Timber Saw, for cutting off timbers up to 16"x16".

Combined Rip and Cut-off Saw, for lumber preparation on the job.

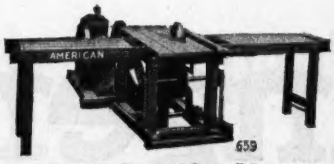
Portable Woodworker, for sawing, planing, boring, mortising—also sanding, and grinding tools.

"Triumph" Planer and Matcher. Planes, matches, beads car siding, flooring, or building material.



Timber Saw

AMERICAN
Saw Mill Machinery Co.
140 Main St.
HACKETTSTOWN, N. J.



Portable Rip and Cut-off Saw

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E. I. du Pont de Nemours & Co.

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Bethlehem Steel Company.

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Fairbanks, Morse & Co.

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Fairbanks, Morse & Co.

Electric Valves.
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Fairmont Gas Engine & Ry. Motor Car Co.

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Wm. Wharton, Jr., & Co.

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Air Reduction Co., Inc.

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Tin Plate.
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Torches, Blow Combination.
Air Reduction Co., Inc.

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Torches, Welding and Cutting.
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Washers.
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Water Column.
American Valve & Meter Co.

Water Crane.
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Waterproofing.
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Fairmont Gas Engine & Ry. Motor Car Co.

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Wire Rope.
Fairbanks, Morse & Co.

Wood Preserving Oil.
Republic Creosoting Co.

Wood Working Machinery.
American Saw Mill Machinery Co.

He Didn't Even Dent It

Someone tried this test on a Wood's Mo-*lyb*-den-um Scoop. He placed the scoop on the floor, took a 14-lb. sledgehammer, and hit the back of it many times with all his might.

These terrific blows, which would have bent or cracked most any other scoop, didn't damage the Wood's Mo-*lyb*-den-um Scoop a bit—didn't even dent it.

The same steel which is used in this scoop is used in the entire line of Wood's Mo-*lyb*-den-um Shovels. Every single one of them will stand this test—and many others fully as strenuous.

All this simply proves that Mo-*lyb*-den-um Steel, treated by Wood's exclusive methods, makes the hardest, toughest, longest wearing shovels on the market today.

The shovel illustrated at the right is designed and built specially for track maintenance needs. It is made of the same hard, tough steel used in the locomotive scoop above. The straps are securely welded onto the blade. The rivets and edges of the straps are countersunk to prevent injury to the hands.

It makes no difference how many you order. The high standard of quality never varies.

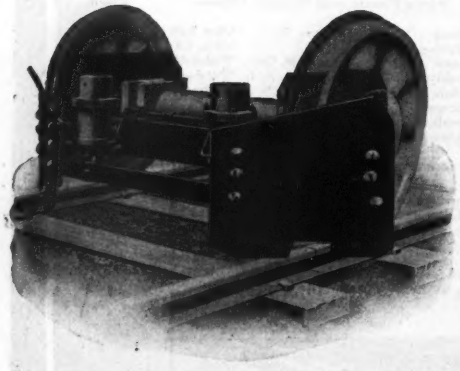
Write for our folder on the track shovel.

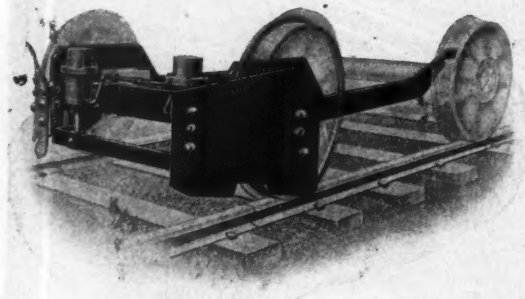
WOOD SHOVEL AND TOOL COMPANY
Piqua, Ohio U. S. A.

This is the Wood's Mo-lyb-den-um Shovel, designed and built specially for track maintenance use. It is made of the same hard, tough steel which is used in the locomotive scoop that withstood the sledgehammer blow.

Wood's Mo-lyb-den-um Shovels

The American Super Steel





Designed and Built on Years Ex
Represent the most formidable sno figh

Years of experience in designing and building snow flangers and plows for both standard and special equipment on nearly all the important railroads throughout the country have enabled us to perfect our snow fighting equipment more and more each year. And today Ray Snow Flangers and Plows are the leaders in their field. Their designs are based on the results of exhaustive tests over many of the railroads and in varied conditions. Being constructed of steel throughout, they furnish the strongest resistance possible in heavy snows.

The locomotive snow flanger is an absolute necessity in removing the ordinary snowfall from the rails and providing a clean flangeway.

Applied to engines and cars of standard or special design, the Ray Snow Flanger is unexcelled in this operation. Heavy steel blades are positioned to the trucks, formed to throw the snow to the sides and grooved to permit a clearance to the railheads. The Ray Snow Flanger is controlled from the cab of the engine. It is forced to its lowest

Q AND C

RAY SNOW FLANGER

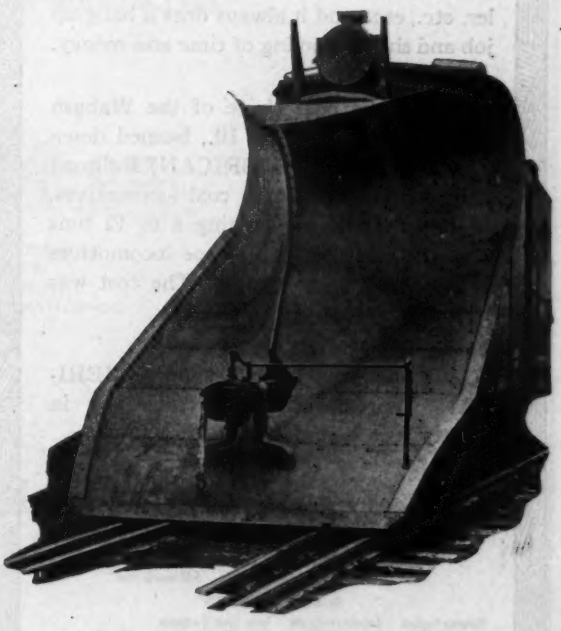
ars Experience Q & C Flangers and Plows
e snow fighting equipment made today

position under air pressure, and is so held until the engineer releases the air. The auxiliary springs then automatically and quickly raise the flanger to its topmost position where it remains until air is again applied.

Ray Snow Plows are scientifically designed to break up the frozen crust without nosing down or riding up. The diverging wings throw the snow to each side, clear of the tracks. They are strongly braced with structural material. Each plow is practically made to suit individual requirements as to width and height. They are designed to be quickly detachable in case the car or engine used is again wanted for other service.

Further information, blue prints, and prices gladly furnished on request

THE Q & C COMPANY
90 West St., New York
Chicago San Francisco St. Louis



R and SNOW PLOWS

There is a certain satisfaction in buying railway pumping equipment—to put your proposition up to American "engineers" who know the particular needs of railroad engineers.

And every American Pump carries with it a straightforward guarantee of its specified efficiency. Fifty years of experience have made a certainty of every American Pump's performance.

THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

Chicago Office
FIRST NATIONAL BANK BLDG.

How many of your water columns are knocked down every year?

What do the repairs and maintenance—not the result of ordinary use—cost you?

Avoid this annoyance, trouble and expense by using a

POAGE Style "H" *WATER COLUMN with* FENNER DROP SPOUT

The three foot lateral range in the Fenner spout and the steel riser in the Poage Style H save the water column from being knocked down by the shifting of the tender.

The tender has to leave the track to knock this column down.

The flexible spout makes it unnecessary to spot the tender accurately. You save time by quick adjustment.

The five foot up and down range enables the water column to fill a tender of any height.

The open telescopic joint does not waste a drop of water. It banishes the usual winter time troubles. Ice does not collect upon it.

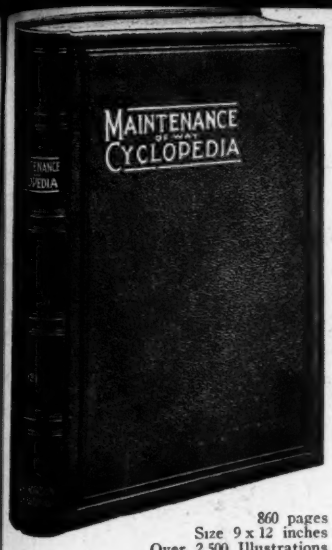
The valve permits the maximum amount of water to flow in the shortest time. There is a minimum of frictional resistance. It shuts the water off quick without water hammer.

Try the Poage Style H column. You will find that it has remarkable operating advantages.

MANUFACTURED EXCLUSIVELY BY

THE AMERICAN VALVE & METER CO.

CINCINNATI, OHIO



860 pages
Size 9 x 12 inches
Over 2,500 Illustrations
Price in heavy buckram binding.....$10.00
Price in full leather binding..... 15.00

EIGHT Tools in ONE

The Maintenance of Way Cyclopedia—a "Handy-Kit" for Maintenance Men

Each of its eight sections is a complete working tool.

The Cyclopedia is a kit of tools you can apply in any emergency and in your daily maintenance operations small or large. No matter what your position, you need (these days particularly) to be the "man who knows his job."

The volume gives the necessary background of authoritative knowledge and covers the maintenance of way field from A to Z. Compiled with the aid and co-operation of the American Railway Engineering Association, the Railway Signal Association and other related organizations it gives their recognized rules and practices. The text is written in plain English. There are over 2,500 illustrations presenting a complete picture of maintenance of way devices, materials and methods of use, well arranged and thoroughly indexed.

The value of the Maintenance of Way Cyclopedia to you cannot be calculated in terms of money. The more you use it, the more it is worth to you in your present position or in preparation for one higher up.

The Cyclopedia is Divided into Eight Sections as Follows:

1. **Track Section—210 Pages.**
   Track laying methods and appliances as well as those used in maintenance work are described and defined. Hundreds of drawings, photos and sixteen large folding plates showing switch layouts, etc., are included.
2. **Bridge Section—77 Pages.**
   Types of bridges and methods used in their construction are described and illustrated. A. R. E. A. specifications for bridge design and erection are given.
3. **Building Section—74 Pages.**
   Various types of railway buildings—passenger stations—coaling stations—engine and freight houses, etc., are described and illustrated by photographs of actual buildings and drawings.
4. **Water Service Section—47 Pages.**
   Appliances and tools needed for water service work are described and pictured in a comprehensive manner.
5. **Signal Section—120 Pages.**
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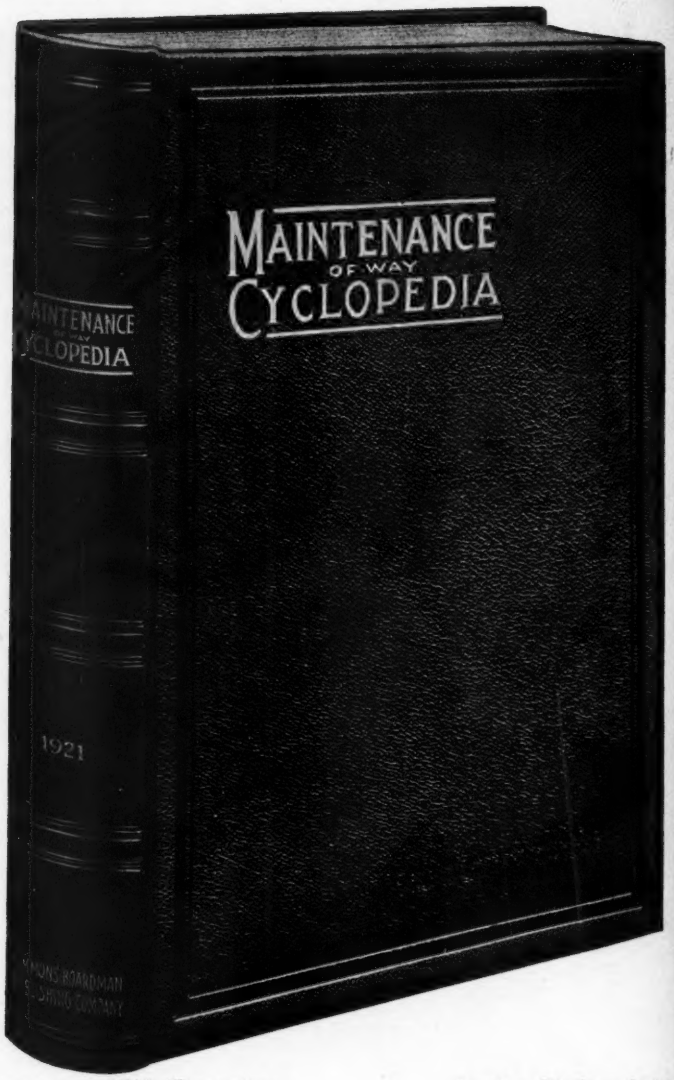

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A Matter of Psychology

Any campaign for increased output from the maintenance of way forces must have its beginning with the supervisory officer. This is the opinion of a maintenance of way executive who has given this subject a great deal of attention. The most important and also the most difficult feature of a campaign for increased efficiency which he instituted was to impress on the minds of the supervisors that it was *possible* to get more work out of the men. After he had been able to convert them to his viewpoint, the efforts were transferred to the foremen and after a few changes in personnel, involving primarily the recruiting of a few old, experienced foremen who had drifted away from railroad work, the problem was largely solved. From the beginning of the mushroom growth of the war industries early in 1916 until the beginning of the business depression late in 1920, this country was saddled with a labor shortage, the like of which had not been experienced since the days of the civil war. Five years' contact with laborers fully alive to their independent position and skillfully adept in rendering the least possible service which would enable them to remain on the payroll, was enough to dull almost any man's knowledge of the reasonable output of a workman under normal conditions. The problem of the maintenance officer, therefore, is to unlearn his experiences of the past five years. The laborer realizes well enough that he must now exert himself if he is to hold his job, for there are many eager to take his place whenever he steps out. However, the workman also has forgotten how much he can do or what may be expected of him. Therefore, unless his foremen demand the maximum reasonable service he will not render it. This situation can be corrected only if the supervisory officer will impress upon the foreman the measure of performance which the gang should accomplish and also show the foreman how he can expect more from his men. This is not a matter of wage rates, but of the relation between the number of jobs and the number of men who want work. The man who has a job now considers himself fortunate and is willing to work hard to hold it.

Closing the Season's Work

By the time this issue reaches those of our readers in the northern states and in Canada, the working season will have drawn so nearly to a close that maintenance of way forces must of necessity concentrate their attention on those duties which will bring their tracks and structures into the best possible condition to enter the winter. Attention to drainage, to picking up rough spots, etc., before the ground freezes will reduce the burden on the roadway during the months when it is impossible to correct such

defects. The railways as a whole are entering the winter in about the same condition as last year. This is a statement of averages which probably does not apply directly to any individual road. The labor situation has improved greatly, with the result that more work has been secured per dollar of expenditure during the season now closing than for several years. As a result some roads have been able not only to make good current wear and tear, but also to take up considerable deferred maintenance. In fact, some roads are now back to their normal pre-war standards. However, an even greater number have been forced to curtail their expenditures so greatly during the past season that they have not made their normal renewals of rails, ties or ballast and have not put the customary work upon their roadbeds. Following as this does several years of similarly inadequate maintenance, the result is that these roads are entering the winter with tracks and structures which are not up to their normal condition. Such tracks will require more than the usual attention throughout the winter to insure continuity and safety of travel. An effort should be made in the short time remaining to correct as many of the deficiencies as possible in order that the tax upon these tracks and structures and likewise upon the men who maintain them, may be reduced to the minimum in the periods of greatest stress. The experiences of the past few years, during which maintenance work has been greatly curtailed, have revealed the inherent strength of our track construction. However, no structure can withstand under-maintenance indefinitely and the longer that under-maintenance continues the greater is the care which is necessary to prevent trouble.

The Opportunities of Railroading

What other present-day business has greater romance, better compensation and swifter chances for advancement than railroading? These three factors—opportunity, compensation, adventure—are the lodestones that draw young men today as truly as they did their fathers 20, 30 or 40 years ago. In place of the old frontiers we have something far more productive of opportunities for service—a large population busy in the further development of our country. In this development the railroads play a part of tremendous importance.

We believe no other business offers better opportunity for advancement to the young man who insists upon advancement. Inertia won't push him to the top any more than it would 40 years ago, but his boss' job is always just in front of him, and the pursuit is still the same old game. The young man has his own future to carve—and many young railway men are carving theirs rapidly today.

Of the official positions on the Illinois Central System, 85 are held by men less than 30 years of age, 122 are held by men between 30 and 35 years of age, and 213 are held by men between 35 and 40 years of age. Three of the executive positions are held by men less than 40 years of age. This proves that opportunity still exists in the railway business.
—*From a statement by C. H. Markham, president, Illinois Central System.*

WATER IN CONCRETE

DURING the last four or five years much of the energy applied to the scientific study of concrete has been directed toward determining the effect of the amount of water used in mixing. Efforts thus expended have gone to show that excessive amounts of water decrease the strength, and publicity given to this fact, primarily through the efforts of the Portland Cement Association, has been effective in extending this knowledge to many of the users of concrete. An excess of water tends to make the concrete porous and those who build concrete structures for a service demanding the greatest density are now bending their efforts to making concrete with the least amount of water that will afford a workable mix. This is particularly true of concrete to be exposed to sea water. Concrete structures built with steel forms in a few cases have manifested a tendency toward hair cracking and in some cases even of a scaling of the surface similar to that experienced when a cement wash has been applied.

These manifestations have been found to have resulted almost entirely from an excess of water in mixing. The spading carried on while the forms are being filled tends to bring the water against the surface and the steel sheathing, being impervious, cannot absorb this surplus water as is the case with wooden sheathing. It has been found that the use of a drier mix will do away entirely with this difficulty, which has occasionally been encountered in the use of steel forms.

The principal obstacle in the way of a transition to a drier mix of concrete has been the great popularity of spouting as a means of delivering the concrete to the forms. This method is so economical that any change in concrete practice which would rule out the spouting method would greatly increase the cost of concrete work. These opposing considerations became the source of a considerable controversy among concrete engineers and as a consequence the masonry committee of the American Railway Engineering Association was unable to fix any satisfactory recommendations or requirements for spouting in the specifications for concrete which were adopted by the association in 1919 and the process was not mentioned.

Subsequent studies of the water proportion have shown that the strength of the concrete is largely dependent on the ratio of the amount of water to the amount of cement. In other words, it has been found that if it is necessary to add more water to make the concrete more workable, or render it more fluid in the spouts, the strength of the concrete may be retained by adding sufficient cement to keep the ratio of the water to the cement constant. It is this and other considerations which have led the Joint Committee on Concrete and Reinforced Concrete to recognize spouting as a legitimate process in the making of concrete, definite provisions being included in the tentative joint committee specification outlining what are considered proper practices in that method of transporting concrete.

THE PRICES OF RAILS

THE announcement made by Judge Gary, president of the United States Steel Corporation, on October 22, that the price of rails had been reduced from $47 to $40, followed as it has been by similar announcements by other manufacturers, affords maintenance officers definite evidence that costs of materials are declining. The price of rails has long stood out in marked contrast with those of other steel products. Instead of fluctuating between

wide limits with each recurring period of business activity or of depression, the quotations for rails were held without variation at $28 from 1902 to 1915. Since that time the prices have risen to as high as $57 for small lots, although few of the larger roads have paid more than $47 and this price has been the standard for the last three years.

Until the present time there has been no reduction in this price, although the quotations of other steel products have declined greatly in recent months. Largely because of this fact and the belief that rails would share in the general decline, the railway managements have curtailed orders for rails considerably during the year and deferred specifications for over 800,000 tons on orders previously placed by them. The immediate response of the roads to this reduction in price has been the release for rolling of over 100,000 tons on these deferred orders. The significance to the railways of this reduction is indicated by the fact that the normal rolling of rails in this country averages approximately 2,500,000 tons. This reduction in price will therefore mean a reduction of $17,500,000 in maintenance expenditures in 1922, which in turn is equivalent to $70 per mile of line.

SUPERVISION AND SUPERVISORY OFFICERS

ONE OF THE difficulties in the way of securing closer supervision of maintenance of way work has been the amount of time which it has been considered necessary for a supervisory officer to give written reports and other accounting data. The *Railway Maintenance Engineer* has often commented upon the detrimental effect which this supposedly necessary practice has had upon the improvement of the track forces and thus upon the track structure. Such remarks as have been made have been, in reality, the editorial expression of the actual sentiments of maintenance men from the rank of engineer maintenance of way to supervisor or roadmaster.

Considerable space has also been given to the fact that adequate records must be kept and that a proper office organization is a necessity, both to the road and to the supervisory officer. There are, of course, times when the office work can be given more attention without any apparent neglect of outside duties. On the other hand, there are often conditions which make it almost imperative that a supervisor spend the greater part of his time out on the line. The present is certainly one of the latter periods, for, as it is only too well known, the roads demand now, as never before, the greatest possible results with the least possible expenditures. Under the more or less abnormal conditions of maintenance now prevailing the maximum results can only be obtained through the efficient utilization of the accumulated experience and knowledge of the supervisory forces.

This is being recognized by the roads and it is becoming more and more evident that it is being put into practice. Of late it has been interesting to observe how little time division supervisory officers are spending in the offices and how much time is being given to the forces along the line. Naturally a greater part of the time is spent on the line during summer, but the present situation has apparently gone far beyond the customary allotment and to all appearances marked economies are being effected. The greatest value which the roads will derive from this increased supervision will not be, however, that covered by the immediate benefits brought about in the condition of the track and structures. It will more likely be in the advance which is being made in the arrangement of supervisory duties, which will permit a supervisor to give a large proportion of his time to outside work and at the same time to carry on successfully the necessary accounting and the several other occupations of the office.

LETTERS TO THE EDITOR

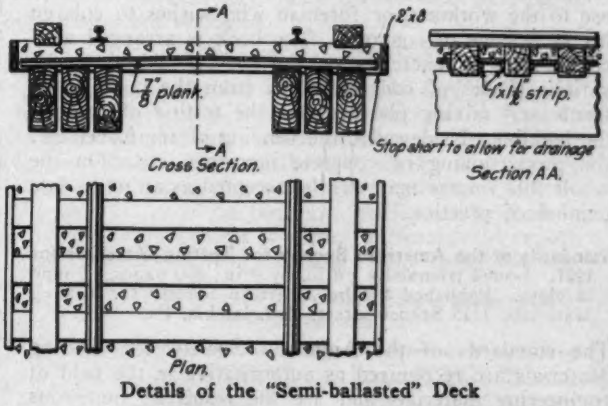
SOME CREOSOTED TRESTLES BURN

Louisville, Ky.

TO THE EDITOR:

The account of the fire-resisting qualities of a creosoted timber trestle on the N. C. & St. L. in the September issue of the *Railway Maintenance Engineer* deserves general consideration and it is to be hoped that further discussion will be invited to determine whether this case was an exception or whether similar results may be expected in case of fires of this kind.

A case brought to my notice is quite contrary to that of the N. C. & St. L. On July 20, 1913, a pile trestle 203 ft. long and 12 ft. high on the Louisville division of the



Details of the "Semi-ballasted" Deck

Pennsylvania was completely destroyed by a fire, the cause of which was never determined. This was a creosoted yellow pine timber structure covered with a "semi-ballasted" deck (as illustrated) provided for fireproof purposes only, and completed only four months before. The destruction was so complete that in the work of rebuilding, which was begun at once, there was absolutely no material to move. The ground which the trestle had occupied was completely bare except for ashes and the stubs of some old oak piling from former trestles.

D. B. JOHNSON,
Division Engineer, Pennsylvania System.

NEW BOOKS

Proceedings of the American Wood Preservers' Association for 1921. 590 pages. Illustrated. 6 in. by 9 in. Bound in cloth. Published by the American Wood Preservers' Association, George W. Hunt, secretary, Madison, Wis.

This volume, which contains the proceedings of the seventeenth annual convention, which was held in the Hotel St. Francis, San Francisco, Cal., on January 25-27, is the largest volume of proceedings which has yet been issued by this organization, containing 220 more pages than the proceedings of last year. This increase is accounted for in large measure by the exhaustive report on the San Francisco Bay marine piling survey, which covers over 150 pages. This report includes the results of a detailed investigation of the recent attacks of marine borers on the piling in railway and other docks in San Francisco harbor. Other reports of interest to railway maintenance of way officers include those on the service results from treated ties, the layout of switch-tie yards, the inspection of timber, and the effect of the zinc chloride process of preservation on the strength of timber.

The proceedings of this association are unique in the amount of statistical data which is also presented relative to the amount of timber treated and the quantities of preservatives used in the United States for the several years since 1909.

Concrete Work, Volume II. By Hatt & Voss. 5 in. by 7½ in. Bound in cloth. 206 pages, illustrated. Published by John Wiley & Sons, 532 Fourth avenue, New York.

This book is a supplement to Volume I, which was reviewed in the *Railway Maintenance Engineer* for February, page 43. Whereas the earlier book is essentially a text-book treating the subject of concrete from the standpoint of the contractor and builder rather than the engineer, this volume is essentially a study manual whereby the student of Volume I may obtain a physical contact with the materials of which he wishes to learn. While the book has been drafted with a view to its use by the student in a university or high school, nearly all of the material is in such shape that it would be of definite use to the workman or foreman who wishes to enlarge his knowledge of concrete. The book is arranged as a compilation of exercises or job sheets, taking up the various phases of concrete work from the building of forms and mixing platforms to the testing of cement, the building of sidewalks, the bending of reinforcement, the proportioning of concrete mixtures, etc. On the whole this volume may well be accepted as an up-to-date manual of practice.

Standards of the American Society for Testing Materials for 1921. Issued triennially. 6 in. by 9 in., 890 pages. Bound in cloth. Published by the American Society for Testing Materials, 1315 Spruce street, Philadelphia, Pa.

The standards of the American Society for Testing Materials are recognized as authoritative in the field of engineering materials and are the result of numerous studies and investigations carried out over a period of years by the society. The present or 1921 volume of standards is the second one issued under the plan of triennial publication and contains 160 standards, including standard specifications, methods and definitions and recommended practice. This volume includes 68 standards relating to the ferrous metals and 31 to the non-ferrous, while other materials such as those contained under the headings of road materials, cement, lime, gypsum, timber, coal, coke, preservatives, lubricants, etc., comprise the remainder. Among the specifications of interest to railway maintenance of way men are those for rails; low, medium, high and extra high carbon steel splice bars; quenched high carbon steel splice bars; quenched carbon and alloy steel track bolts; track spikes; structural steel for bridges; billet and rail steel concrete reinforcement bars, and wrought iron pipe.

Proceedings of the American Railway Engineering Association. 6 in. by 9 in. Bound in cloth or paper. 1,092 pages, illustrated. Published by the American Railway Engineering Association, Manhattan building, Chicago.

This is the twenty-second annual volume of this important work on railway engineering and maintenance of way and, like the preceding volumes, represents a progress report on the studies being made from year to year by the various regular standing committees of this association.

With 23 sub-committees covering practically every conceivable phase of the maintenance and construction of railway tracks and bridges and buildings it contains a fund of highly diversified material. As an indication of the nature of information contained, mention may be made of the summary of the statutes governing the protection of highway crossings in the various states, prepared by the Committee on Signs, Fences and Crossings; an extended report on car repair sheds, by the Committee on Shop and Locomotive Terminals; a manual for the guidance of maintenance of way employees, by the Committee on Rules and Organization; a report on the use of concrete in sea water, by the Committee on Masonry; and the cleaning of water mains, by the Committee on Water Service. The important Committees on Track, Roadway, Ties, Rail, etc., also present valuable matter on fundamental railway questions and problems arising in and being handled by these departments.

Material Handling Cyclopedia. Edited by Roy V. Wright and John G. Little. Bound in cloth and leather; 850 pages, 1,500 illustrations, 11½ in. by 8½ in. Published by the Simmons-Boardman Publishing Company, Woolworth building, New York City. Price, cloth, $10; leather, $15.

This is the latest addition to the library of transportation literature published by the Simmons-Boardman Publishing Company. The volume is a companion book to the Maintenance of Way Cyclopedia, the Car Builders' Dictionary and Cyclopedia, the Locomotive Dictionary and Cyclopedia and the Shipbuilding Cyclopedia.

The purpose of this cyclopedia has been to bring together in a single volume, complete, practical working information about the many types of material handling devices used in industry. For purposes of arrangement this book has been divided into three sections. The first is a Dictionary section containing definitions of all the usual terms to be encountered in the various ramifications of material handling. The Text section is a compilation of expositions of all the various appliances, devices and materials used, arranged in the form of chapters and sections devoted to the various classifications of materials and equipment and arranged in what is considered the most logical order. The Catalog section is devoted to describing and illustrating the products of the manufacturers.

The Definition section, in addition to its purpose as a dictionary of material handling terms, methods and devices, serves as an index to other sections of the book. Following the definition of each device receiving further treatment in the book is a reference to the page in the Text section or Catalog section on which the additional information appears. Thus, from the definition the reader is referred not only to the detail description, method of operation and illustration of the device given in the Text section, but as well to the page in the Catalog section where the device which he has selected as best suited for his needs is described authoritatively by the manufacturers.

The Illustrated Text section covers practically every conceivable form of equipment used to save labor in the handling of material. Of particular interest to the officers in the maintenance of way department are chapters on hoisting machinery, containing detailed information concerning hoisting engines, rope, tackle, chains, cables, etc.; a section on derricks covering also pile drivers; data on excavating machinery including steam shovels, ditchers, buckets, etc.; and a chapter on cranes covering locomotive cranes, gantries, etc. Chapters on trackless transportation and industrial rail transportation cover the various modes of locomotion used in the hauling of materials other than standard-gage railway transportation. For instance, the section on rail transportation includes descriptions of cars for hauling concrete, air dump cars, cars for use at timber treating plants, etc. A General Subject Index covering the entire contents of the book is an additional help in making the information readily available.

DISTRIBUTING EXPENDITURES IN TRACK MAINTENANCE

Gulf, Colorado & Santa Fe is Obtaining Increased Interest and Efficiency by Means of New Work Records

By J. L. STARKIE
Office Engineer, Gulf, Colorado & Santa Fe, Galveston, Tex.

FOR NEARLY two years the Santa Fe System, Gulf Lines, has conducted an extended investigation of the feasibility of recording the unit expenditures for track maintenance for the purpose of obtaining increased interest and greater economy in the conduct of this work. Thus far, this study has been limited to a single division, but the results secured have been so favorable that the plan is now being extended to two other divisions. The principal feature of this plan is a record of the work done, whereby the hours expended per unit of work is recorded and by making this information available to the foreman each month, a spirit of rivalry has been engendered with most wholesome results.

The plan had its inception in August, 1919, when F. G. Pettibone, general manager, appointed a committee to study the subject and, if possible, to work out a plan the ultimate object of which was to be the securing of more work at a lessened cost. As a starter, he suggested that a yard stick, or measuring rule, should be established, which would serve to gage the relative efficiency in the performance of the several parts of the work by the various gangs. Something parallel with the "gross ton mile" or other well established units of the transportation department was what he wanted to replace the existing method of measuring maintenance performance by the dollars spent on such work per mile, per month, or per year.

The general manager, having in mind the necessity of insuring proper co-ordination between the several departments concerned, and that any plan worked out must be practical in its application, assigned the task to a committee consisting of J. L. Starkie (chairman), office engineer; W. A. Reed, roadmaster; J. T. Bradley, section foreman; F. E. Box, section foreman; L. B. Adams, division accountant; C. F. Kanewske, traveling accountant.

Realizing that the large ratio which maintenance labor expense bears to total income justifies considerable effort toward reductions of this expense, and appreciating the numerous difficulties standing in the way, the committee undertook the task at once. Frequent meetings were held, not only of the committee itself, but with as many other roadmasters, section foremen, accountants, engineers and others interested on the Gulf Lines as could be spared from their duties at any one time. Methods in effect on other railroads were reviewed and studied, and finally a plan was developed containing sufficient promise to justify a trial. The plan was therefore put into application experimentally on the Northern division, beginning with the month of April, 1920.

The "yard stick" early decided upon was the "Man Hour," among other reasons, because it is as nearly constant for any unit of work as anything depending upon the personal equation is likely to be, and further, because it is unaffected by changes in rates of pay, many of which have taken place within the past few years. The real value of the plan lies in stimulating and sustaining an interest in the work by creating a rivalry among the men as to the excellency and economy of their performance. In 17 months of the test on the Northern division no difficulty has been experienced in keeping up enthusiasm and interest.

ALL WORK WAS DEFINED

The basis of the plan is exceedingly simple and consists of a dictionary containing definitions of 70 units or classes of work into which roadway maintenance has been separated. Each of these 70 classes of work has been defined, using the terms and language of the section men, so as to be the more readily understood by them, in such a way as to secure uniformity of reporting on the part of the foreman. The definitions are

INSTRUCTIONS FOR REPORTING AND DISTRIBUTING ROAD AND TRACK WORK TIME CHARGES

	Class of Work	Items to be Included	Manner of Reporting
1	SPOTTING TRACK:	Raising low joints Leveling and lining trackage Dressing ballast to former standard condition.	State: Number of lineal rail feet, spotted Kind of ballast.
2	GRASSING TRACK:	Cutting and disposing of all vegetation out of ballast, full width of roadbed and 18" wide at toe of ballast on each side.	State: Number of track feet cleaned Kind of ballast (Where full width including 18" past ballast toe line is not cleaned, state how much.)
3	PUTTING IN TIES:	Distributing new ties Removing old ties Placing new ties to correct space in rail Replacing tie plates Spiking new ties to gauge and gauging old ties, if necessary Bedding new ties Disposing of old ties Redressing ballast to Standard Apply dating nails.	State: Number of ties Kind of ballast (If putting in 2nd hand ties, add the word "Old" to description) (When ties are put in on account of a derailment charge to Item No. 27.)
4	CLEANING RIGHT OF WAY:	Removing or otherwise disposing of miscellaneous scrap dirt, drift, trash, rubbish etc. from tracks and right of way.	State: Length of Right of Way cleaned by width in feet, whether in yards or on line. Separately, time applying to maintenance scrap (See Items 34, 35 & 36 which are separate charges.)

Fig. 1. Reproduction of the First Page in the Instruction Book

worded so as to make as clear as possible where a job commences and where it ends. For instance, "Putting in Ties" is defined as follows:

> Distributing new ties.
> Removing old ties.
> Placing new ties to correct space in rail.
> Replacing tie plates.
> Spiking new ties to gage and gaging old ties if necessary.
> Bedding new ties.
> Disposing of old ties.
> Redressing ballast to standard.
> Applying dating nails.

Figure 1, which is a reproduction of the first page of the instruction book, gives definitions of the first 4 of the 70 classes of work. It should be understood that heretofore the foremen reported in their own words the work their men were doing and with this in mind it can readily be appreciated that when one foreman reported "Putting in Ties" he did not necessarily mean doing the same things that some other foremen did who also reported "Putting in Ties." As a consequence it is practically impossible to make any intelligent compari-

sons, based on such haphazard methods of recording track department time charges, because they were not on a common basis. This is a condition which has been corrected in the dictionary for all classes of work.

There is required of each foreman a daily report (Fig. 2), showing for each of the classes of work on which his men were engaged during the day, the number of "Man Hours" so spent, the location by mile post or station name and, most important of all, an accurate statement of the exact quantities of work performed expressed in prescribed units.

Of course there is other information required to be shown by the foreman, as for example, the kind of ballast, it being desirable to make direct comparisons, in most cases, of work performed in the same kind of ballast. After we have obtained a few years' records under the new system, and the various item averages have developed standard records, there is no reason why accurate comparisons between work of the same class in different kinds of ballast cannot be made by applying the ratio found to exist between the averages in the respective kinds of ballast.

From the daily reports of the foremen average performances for each class of work are computed monthly for each section, for each district and for the entire division, and for a number of the more important classes of work graphic charts are prepared which are forwarded monthly to the division engineer, roadmasters and track supervisor, and they in turn pass the information on to the section foreman and laborers (see Fig. 3). It is an interesting fact that any delay in issuing these charts after the end of a month is frequently the cause of complaint on the part of the foremen who are anxious to learn their standing as compared with that of other foremen.

SAVINGS BEING OBTAINED

Relative to the saving, the records show, since the starting of the new system, that for the principal items of roadway maintenance work there has been a gradual lessening of the cost per unit. The average for spotting track in rock ballast for the entire division has dropped from 9.8 man hours per 100 rail feet in April, 1920, to 7.1 man hours per 100 rail feet in May, 1921 (see Fig. 4). Also the same kind of work in gravel ballast has dropped in a similar period from an average of 9.4 man hours to 5.4 man hours per 100 rail feet. Putting in ties in rock ballast has dropped in the same period from 1.7 man hours to 1.2 man hours per tie, and in gravel ballast from 1.7 man hours to 0.9 man hours per tie. Practically all classes of work show this decreased cost in later months. However, it is not claimed that all of this increased efficiency is due to the new method, be-

Daily Distribution of Work Performed by _____ Gang No. _____ (LOCATION) No. of men working _____ 3

Date _____ 192__ (Do not include time of Foreman, Asst. Foreman and Timekeeper) _____ Foreman

Class of Work (1)	Amount of Work (2)	Location Mile or Station (3)	Track Number (4)	Hours (5)	This Column not to be used by Foremen: Account Number	Class	Line	Authority: Number	Authority: Year
1. Spotting Track	Lin. Rail Feet Spotted in ____ Ballast				220				
2. Grassing Track	Track, Feet Grassed in ____ Ballast				202				
3. Putting in Ties	Ties Inserted in ____ Ballast				220				
4. Cleaning Right of Way	Feet long by ____ Feet Wide				202				
5. Cleaning Ditches	Lin. Feet ____ Ditches Cleaned by Men				202				
	Lin. Feet ____ Ditches Cleaned by Teams				202				
6. Repairing Fences	Lin. Feet ____ Fence Repaired				221				
7. Repairing Road Crossings	Crossings				225				
8. Loading or Unloading Material	Car No.								
9. Trucking Material	Trucked ____ Feet								
10. Scuffing (Grass and Vegetation)	Lin. Feet of Cut Ditches								
11. Mowing with	Lin. Feet by ____ Feet Wide ____ Side				202				
"	Lin. Feet by ____ Feet Wide ____ Side				202				
12. Respacing Ties	Ties Respaced in ____ Ballast				220				
13. Putting in Switch Ties	Ties Inserted. No. ____ Frog in ____ Ballast				220				
14. Lining	Track Feet Lined				220				
15. Gauging	Track Feet Gauged				220				
16. Tightening Bolts	Joints Tightened. Used ____ Bolts				220				
17. Repairing Switches	Switches				220				
18. Tending Switch Lamps	Lamps Tended								
19. Patrolling Track	Miles Account				202				
20. Unloading Ballast	Cars ____ Ballast Car No.				218				
21. Replacing Broken or Defective Rail	Lin. Ft. ____ lb. used. Released ____ Lin. Ft. ____ lb				220				
22. Sub-Grade Work	Lin. Ft. ____ by				202				
23. Whitewashing	Whitewashed								
24. Burying Stock	Head ____ Buried; killed by Train No.								
25. Unloading Coal	Tons for ____ Car No.								
26. Clearing Derailment					415				
27. Repairing Track Acc't Derailment	Trk. Ft. Repaired. Used				220				
Remarks	Total								E

Fig. 2. Foreman's Daily Report

cause that would be overlooking the efforts of the division superintendent who, at the latter end of this period, instituted a strong efficiency campaign.

It has been thought that although the charts mentioned heretofore (Fig. 3) are desirable in sustaining the interest of the men and thus continuing the efficiency by showing the actual performance of each section gang comparatively for different classes of work, they do not convey a general idea of the maintenance performance because they involve too small a subdivision of the whole and involve too great a mass of detail for rapid assimilation by a busy manager. Therefore, in order to provide a report giving a general picture of the relative efficiency maintenance performance for the manager, all road and track maintenance work is divided into four groups, as follows:

Group A—Work pertaining strictly to the maintenance of track and roadbed.
Group B—Policing—Work devoted to cleaning the right of way and station grounds, tending park, mowing right of way, etc.
Group C—Extraordinary work, such as repairing washouts, clearing derailments, and including work performed for other departments.
Group D—Work performed by section forces or by track extra gangs, in connection with additions and betterments.

From the following table divided on this basis it is interesting to note how closely the percentages for these four groups run on each district. Of course, any unusually large amount of Group D work (Additions and Betterments) performed by section forces would tend to throw these ratios out of balance unless performed in equal ratio to the total work on each district for a given period, which is a condition probably never to be encountered in actual practice.

STATEMENT OF LABOR COSTS

MAN HOURS FOR YEAR ENDING MARCH 31, 1921, DISTRIBUTED INTO GROUPS A, B, C AND D

District	Group A Man Hours	Group A Per Cent	Group B Man Hours	Group B Per Cent	Group C Man Hours	Group C Per Cent	Group D Man Hours	Group D Per Cent
Fourth	333,223	80	49,734	12	21,002	5	12,747	3
Fifth	232,529	80	37,407	13	16,042	6	3,047	1
Sixth	411,425	79	50,272	10	20,077	4	37,445	7
Eastern Oklahoma ..	176,838	86	20,267	10	8,126	4	.....	0
All	1,154,015	80	157,680	11	65,247	5	53,239	4

Another important feature has been to reduce physical features to equivalent main track miles for each section, due consideration being given to converting sidings, switches, crossings, bridge approaches, ditches, chronic wet spots, buildings and grounds, etc., into mileage, and with this information and the data obtained from the daily reports of the foreman there is set up *"daily man hours per mile"* for each of the four above mentioned groups and for each section, district and division, covering any period of time desired. Such figures show the relative general efficiency for a comparison of the performances of one gang, district or division with another, or with previous performances.

Among other benefits derived from the method is that an accurate record of the location, which is required, makes it easy to develop any unusually high costs at particular locations, calling attention to the fact that some means of correcting such conditions permanently is desirable, and giving figures, after the deduction of normal costs from the total cost, on which a capitalized value can be set up, establishing how much may be spent economically to correct such conditions permanently. We are now obtaining a set of records from which accurate unit costs may be developed which can be used as a basis of advance planning of future work, and in this connection the details of the unit cost of a number of items in which he is particularly interested have been compiled for the division superintendent. Also, by means of the data obtained, more effective and equitable distribution of the forces is possible.

As indicated previously, the work requires additional supervision. On the Northern division one track supervisor has been added to the previous personnel. He is continually going from section to section on a motor car, discussing the subject with the foremen, educating them

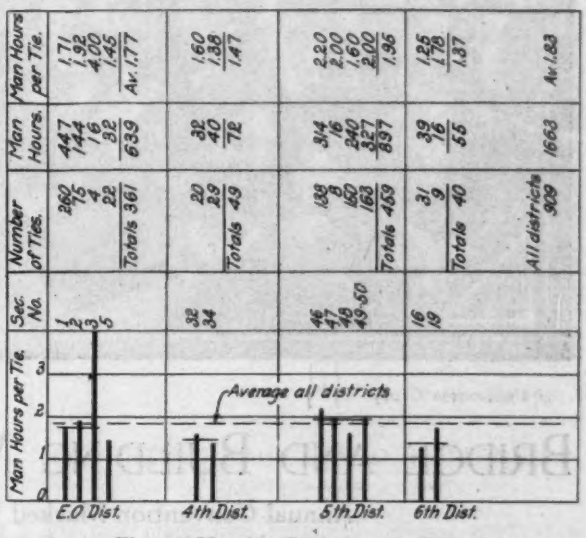


Fig. 3. Monthly Performance Chart

in the standardization, straightening them out on questionable points and securing uniformity of reporting, laying particular stress on the matter of reporting accurate statements of actual quantities of work performed.

The successful results obtained in the application of the standardization on the Northern division have influenced the general manager to authorize the extension to the remaining divisions on the Gulf Lines, and it is planned to apply the plan on the Southern division be-

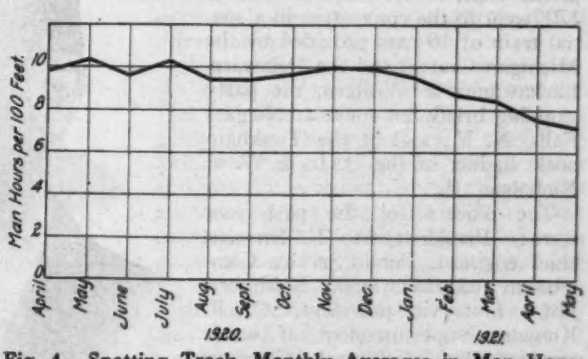


Fig. 4. Spotting Track, Monthly Averages in Man Hours per Foot of Track

ginning November 1, 1921, and later to the Galveston and Beaumont divisions, it being desirable for administrative reasons to extend the application to one division at a time. It is felt this should not end with application to road and track maintenance alone, but could profitably be extended to all other branches of maintenance work. The bridge and building, telegraph and telephone, and signal departments perform work that is embraceable in a similar plan and preliminary steps to this end have already been taken by these departments.

A Convention Group.

BRIDGE AND BUILDING MEN MEET IN NEW YORK

Annual Convention Marked by Large Attendance and Active Interest in Reports and Discussions

THE thirty-first annual convention of the American Railway Bridge and Building Association, which was held in the McAlpin hotel, New York City, on October 18-20, was the most largely attended in the history of this organization. Over 275 members of the association registered, in addition to over 100 guests. Those from Chicago and points west, to the number of over 170, went to the convention in a spetial train of 10 cars provided by the Michigan Central and the Delaware, Lackawanna & Western, the party stopping briefly en route at Niagara Falls, N. Y., and at the Tunkhannock viaduct of the D. L. & W. at Nicholson, Pa.

The officers for the past year were: President, W. F. Strouse, chief engineer, Public Service Commission of Maryland, Baltimore, Md.; first vice-president, C. R. Knowles, superintendent of water service, Illinois Central, Chicago; second vice-president, A. Ridgway, assistant chief engineer, Denver & Rio Grande Western, Denver, Colo.; third vice-president, J. S. Robinson, division engineer, Chicago & North Western, Chicago; fourth vice-president, J. P. Wood, supervisor bridges and buildings, Pere Marquette, Saginaw, Mich.; and secretary-treasurer, C. A. Lichty, general inspector, Chicago & North Western, Chicago.

W. F. Strouse
President

The convention was called to order by President Strouse promptly at 10 o'clock on Tuesday morning and was opened with prayer by C. A. Lichty. The association was welcomed to New York by Francis P. Bent, member of the Board of Estimate of the City of New York, and by W. G. Besler, president and general manager of the Central Railroad of New Jersey. Mr. Besler referred to his early contact with bridge and building foremen and supervisors and then spoke at length on the crisis through which the roads were passing. While expressing the belief that there would be no strike, he stated that a railway officer would be blind indeed if he did not take the action necessary to meet it, and he stated that the roads were taking all necessary measures. He pointed out the fact that while an organization can call its members out, it cannot call them back, and referred to the risk which a man with a family is taking in leaving railway service under present conditions.

The report of the secretary-treasurer showed approximately 80 applications for membership and a total membership, including these applications, of over 900, with a balance of $1,609.21 in the treasury.

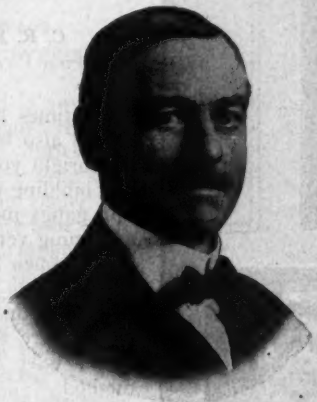
President's Address

In his opening address, W. F. Strouse, president, also referred to the threatened strike. "In casting a retrospect over the past few years," he said, "it occurred to me it might not be amiss to review briefly a few incidents affecting the railroad and general industrial situation as

Taken on Tuesday Morning.

they confront us today. Until a few days ago I thought I saw a rift in the clouds of depression which have surrounded us and felt a brighter and better day would soon dawn. Today, when men's nerves are badly worn and the production and transportation of the country are almost at the lowest point; when the cost of living is still high, although the tendency of wages is downward; when absence of demand has closed factories and thrown millions out of work, we see the most highly organized branch of labor declaring that it will not accept the wage reductions ordered by the Railroad Labor Board and voting to strike.

"In the final analysis I am convinced that much of the trouble, distress and misery which harasses the world today can be traced to selfishness and misconception of the meaning of the little word 'public.' While it means 'all the people,' the average man is inclined to think it means the 'rest of the people,' but not himself, and therefore looks upon and thinks about the public as 'other people.' Yet he expects these other people to think his kind of thoughts, to speak his language and do his way. When they act otherwise, he is surprised and hurt. Unfortunately, he has never tried to see what kind of people the public is composed of.



C. A. Lichty
Secretary-Treasurer

"While it is indeed true that the prices of structural steel, lumber and many other construction materials have dropped quite appreciably, and that certain branches of labor have agreed to fair reductions, it is a sad commentary to witness the stand taken by other classes of labor, and this in the face of the fact that millions of their fellowmen are now unemployed. I appeal, therefore, for loyalty to your respective companies in these times of adversity."

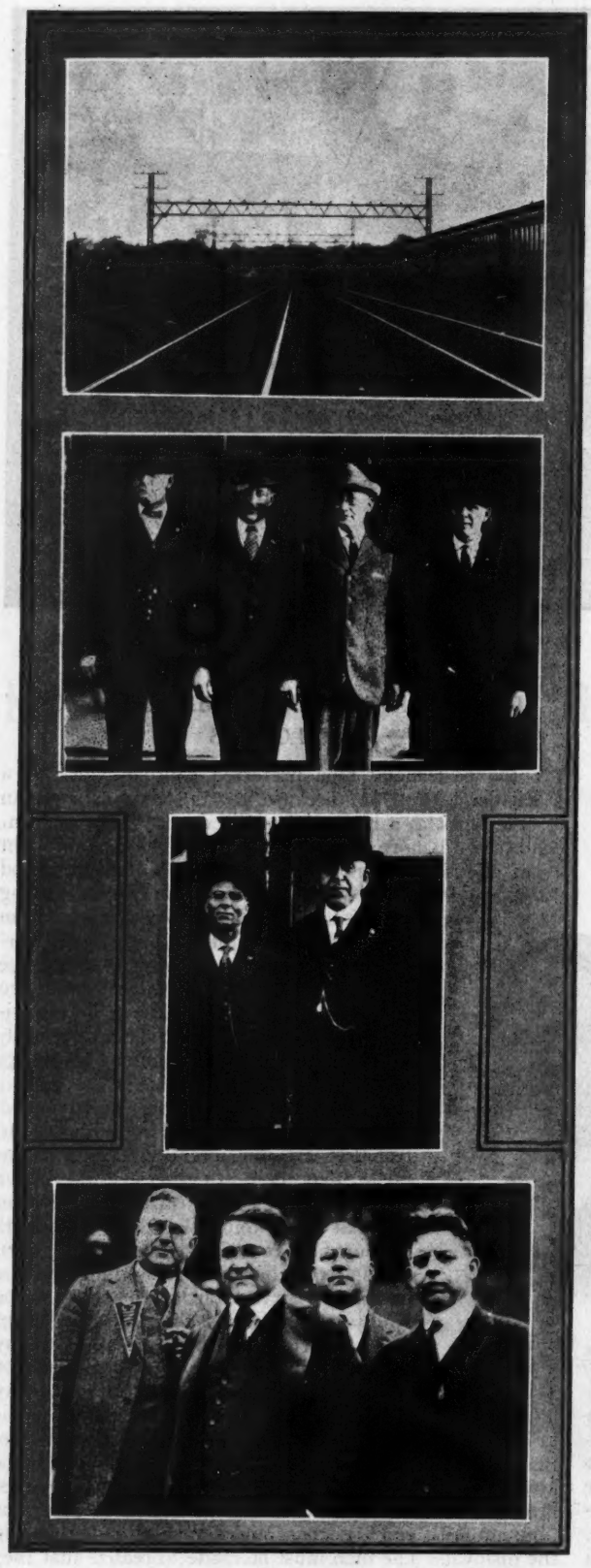
"In conclusion, I wish to state that I consider it a very great privilege to be permitted to preside over this convention, and I want to extend a hearty greeting to all our members and friends assembled here this morning."

RECRUITING BRIDGE AND BUILDING EMPLOYEES

IN the past many men preferred railroad work at a smaller rate of pay because it was steady rather than to take work at a higher rate that was irregular and indefinite with more or less idle time. The war brought about a different condition; men were able to get good wages, fairly steady work and more comfortable living conditions if obliged to be away from home. It will be difficult for men to overcome the desire for a continuance of these conditions, and this fact must be taken into consideration when increasing activities again bring up the problem of recruiting men, because they are among the things offered in return for service.

When men are invited to enter the service of the railroad they should be made to feel that it is the intention to treat them fairly, that their grievances, if they have any, will be given careful consideration and that if it is found that their complaints are justified, remedial action will be taken promptly. The foreman should show a disposition to be fair and impartial, be ready to grant minor privileges consistent with the rules of the railroad company and should not take unfair advantage of technicalities or be guilty of what may be termed "sharp practice." Men in supervisory positions should at all times make the men under them feel that they have an interest in their personal welfare, be kind and considerate, yet fair and firm in their demands, protect the interests of the loyal men and at the same time act with equal fairness and firmness in disciplining the disloyal. The men must be made to realize that they also have obligations and that they are expected to respond to their superior officers in the same spirit of interest and fairness.

Experience indicates that the most satisfactory workmen are those who live on the division or section on



Convention Views

Inspecting the Electrified Line at Stamford, Conn.
A Group of Pennsylvania Men
From the Southern Pacific
The Supply Men Were There

which they are working, and of these the most desirable are those who are married and who visit their families weekly. A married man with a family is less likely to be attracted by the seasonal and occasional occupations at higher wages, because he plans for the future and he knows by experience that he cannot afford many periods of idleness.

Replies to inquiries indicate that the shipment of men from large cities by labor agencies is seldom satisfactory for bridge and building service. The men so obtained are "floaters," and do not remain long enough to receive proper training or to become trustworthy and efficient. Fortunately it is not often necessary to hire men in very large numbers for bridge and building work and the supervisor and foreman may do many things that will keep them in touch with available men.

In going over his district a supervisor can make inquiry at the various cities and towns regarding probable recruits. He can ask station agents to be on the lookout for desirable men and urge his foremen to make inquiry at the towns where they live. In this way he will

C. R. Knowles
First Vice-president

Arthur Ridgway
Second Vice-president

at all times have a list of available and desirable men. It will also be found that section gangs frequently contain bright young men who will develop into good bridge and building men. Their experience and training in section gangs make them familiar with railroad conditions, a training very desirable for bridge gangs. When necessary to open a bridge, it is a great satisfaction to a foreman to have several young men whom he can send out to flag trains and leave the more experienced bridge men where they can do the most good. Some supervisors have had very good success by following this method.

Having let it become known that you are in need of additional men and that applications are desired, make it a point to acknowledge each application properly, letting the man know that it is receiving consideration, and also make a proper record. You may receive more applications than can be used on this particular occasion, but a week or two later you may be in the market again. Every applicant should be investigated carefully, not only as to his qualifications as a workman but as to his habits and temperament. Is he cleanly and companionable? Can he bunk with other men without causing disturbance or friction? One grumbler in a camp can do a lot of harm. Is he honest and trustworthy? Men in camp have clothes and valuables that they must leave in camp while at work and they are entitled to feel that their property left behind is secure against meddlers.

Some supervisors make a practice of getting acquainted with applicants, even though they do not need their services at the time, by writing to them or looking them up when in their town. This has been done with good results. They know just where to go when the need for more men comes.

Occasion may arise when it is necessary to call upon a labor agency in a large city to supply men for bridge and building work. Unusual conditions call for special treatment, but such a case is no doubt for a special job and involves temporary employment only. This condition must be faced by placing orders with the most reliable labor agency available and it would be better to send a man from your own forces to interview and select the men. The selection of men in this way is, of course, at best a matter of personal judgment and it will be necessary after a few days' service to weed out the less desirable men.

When men enter a railway company's service there should be given a definite understanding of what is required of them and what they will receive in return. The

J. S. Robinson
Third Vice-president

J. P. Wood
Fourth Vice-president

question of wages and occupation are settled in advance, but just as important as these are the new man's relation to his fellow workmen, his assignment of duties, his place at the table and in the bunk car. There should be definite rules of behavior, time for retiring and rising, for smoking and talking in the bunk cars, a definite time after which everything must be quiet, sanitary arrangements and numerous other things that are necessary for the conduct of the crew. Sometimes such rules are printed and posted in the cars or camp, but this is not always necessary. The important thing is that the men understand what the rules are and that they will be enforced. It will be found much easier to maintain discipline if the newcomer understands these matters in advance.

Committee: F. W. Hillman (C. & N. W.), chairman; S. C. Tanner (B. & O.), J. E. Buckley (B. & M.), J. K. Davidson (Penna.), Frank Lee (C. P. R.), E. G. Storck (P. & R.).

Discussion

T. B. Turnbull (Ann Arbor) emphasized the necessity of supervisory officers giving more attention to the training of their foremen in the handling of men, for these foremen constitute the point of contact between the men and the company which employs them.

In discussing the handling of applications, J. P. Wood (P. M.) stated that he answers all written applications as received and then files them, keeping in touch with the applicants. He keeps a similar record of all personal applications. R. C. Henderson (B. & O.) makes it a

Convention Views
The Hell Gate Arch
On the New Haven Trip
The Soo Line Was Represented
The Duluth Representation

Convention Views

Inspecting the D. L. & W. Station at Nicholson, Pa.
Some of the Lehigh Valley Men
Discussing the Tunkhannock Viaduct
Some Northwestern Men

practice to turn all applications for employment over to the foremen in charge of the territories in which the applicants live. He places the responsibility on the foremen of keeping their gangs full and sends men to them only on their request, retaining supervision over the employing of men to see that only those of the proper standard are secured. L. Beck (Virginian) advocated allowing the foremen to hire their own men, stating that it was his practice to send them applications for employment only on request. C. A. Lichty (C. & N. W.) cautioned against the danger of permitting foremen to hire men because of the fear that some foremen are not good judges of men.

The suggestion that bridge and building employees be recruited from the section forces created considerable interest. R. H. Reid (N. Y. C.) stated that on the New York Central the section gangs had been found to be an excellent source of labor. Where bridge and building supervisors locate trackmen suitable for their gangs, they arrange for the transfer of these men through the proper channels. J. S. Robinson (C. & N. W.) stated that he had followed a similar practice and that he had found it possible to train Italian and Bohemian track laborers in the Chicago terminal district into efficient water service employees.

R. H. Reid stated that while the question of nationality is not raised in employing bridge and building men on his road, all men taken on must be able to read and write. In reply to a question regarding the requirements of a physical examination, he stated that all employees of the bridge and building department are required to take such an examination on the New York Central, and he expressed the opinion that it would be an excellent plan to also require the workmen to be citizens of the United States. G. W. Andrews (B. & O.) stated that it was the practice on his road to require physical examination of all employees holding positions commonly classified as hazardous, this examination being waived only on special authority granted in unusual and emergency circumstances.

THE DETECTION AND REPAIR OF LEAKS IN WATER MAINS

THE detection of leaks and the repair of leaking pipe lines laid above ground do not offer any serious problem, for the reason that leaks and breaks in such lines make their presence known at once and with few exceptions the break is easily accessible and the necessary repairs become merely a matter of routine work. It is quite different, however, when leaks occur in pipe lines laid underground, as such leaks are not only very hard to locate at times but are also extremely difficult and expensive to repair.

The several causes of leaks in underground water mains may be classified in the order of their importance as follows: (1) Jars and shocks due to vibration, etc. (2) Joints poorly made. (3) Water hammer. (4) Unequal settlement of pipe. (5) Deterioration through ovidation and electrolysis, and (6) Expansion and contraction of pipe.

The first named cause of leaks is by far the most important in railway water service as the greatest expense for maintenance of pipe lines on a railroad arises where they are laid under or alongside tracks. This is especially true of lines laid in yards and terminals.

Within certain limits there is little difference in the cost of repairing various sizes of cast iron underground mains, as the principal expense is incurred in the excavation, unwatering, shoring and protection of the trench, the actual expense involved in the specific work of repairing the leak being comparatively small.

The detection of leaks in water mains laid underground is sometimes a very serious problem, as such leaks do not always show on the surface, particularly where the mains are laid in a porous formation such as sand, cinders, loose rock, etc., or in proximity to sewers and drains. Leaks in mains laid under these conditions may assume enormous proportions and continue for years before they are discovered. It is needless to say that the losses through such leaks will justify considerable effort and expense to overcome them.

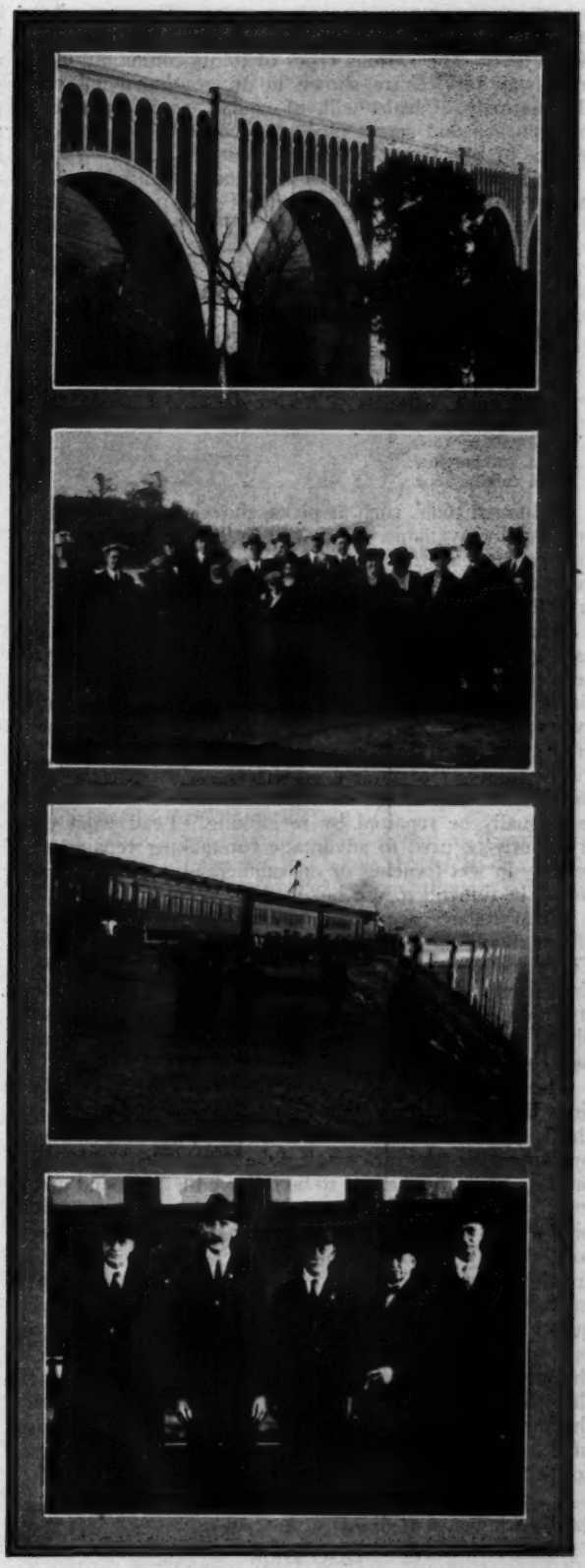
As an example of the losses that may occur in underground water mains from leaks that do not appear on the surface, a survey made at Washington, D. C., showed 93 concealed leaks on underground water mains which were wasting 1,034,000 gal. of water per day. The presence of such leaks is often made apparent only through a greatly increased consumption of water. Even then they are sometimes exceedingly difficult to locate. It is obvious that so far as determining the presence of leaks is concerned the problem lies with those that do not show on the surface. With a straight line of pipe or a system of piping where the location of each line as well as the outlets are definitely known the procedure is comparatively simple, as it consists merely of closing the various outlets, maintaining a pressure on the line and checking the losses through the decrease in pressure or by the speed of the pump. If the line is metered the meter reading will, of course, show the exact loss, and if it is possible to isolate each line the survey may be confined to any particular part of the system.

On extensive and complicated systems of pipe lines, such as at shops, yards and terminals, the location of lines and outlets is not always known and the valves controlling the various connections may leak, with the result that it is almost impossible to make a pressure test of the pipe lines. A check of the quantity of water pumped against the actual requirements will often indicate a leakage, but as a general rule only a leak of considerable proportions may be found through this method. An examination of the sewers and drains will show whether any abnormal waste exists. Other methods may suggest themselves in each case.

After it has been determined definitely that a leak exists, the matter of locating it is still more difficult and no rule may be suggested that will prove infallible. The methods generally followed are the use of the aquaphone or what is generally known as a "leak finder." This instrument is similar to a common telephone transmitter connected to a small rod instead of a wire. The rod is applied to the pipe and under favorable conditions the sound of the leak will be transmitted to the ear; by following the pipe the location of the leak may often be determined. The use of the aquaphone on underground pipe lines may, however, entail almost as much excavation as would be necessary to uncover the line. The use of this instrument also requires considerable practice and experience to locate leaks quickly. Another method is to make a comparison of the pressure on the line at various points, as a pressure drop will occur on the pipe line beyond the leak in the direction of flow due to the decreased friction.

An instrument known as the pitometer has been used extensively in the larger cities to determine the presence of leaks. The pitometer is a device by means of which the velocity of flow in the main may be determined. While there are, of course, points where the pitometer could be used to advantage in railway water service, its use as a general thing is limited.

No set rules may be laid down for the repair of leaks, as the method of repair will depend upon the nature of the break and the materials available for repairs. This



Convention Views

The Party Stopped at Tunkhannock Viaduct
At Niagara Falls
The Special at Tunkhannock Viaduct
Some of the Reading Men

is particularly true of emergency cases. The method to be followed in making repairs will depend upon the nature of the leak. The various types of joints commonly used in railway service are shown in an accompanying cut. The majority of leaks will, of course, result from bad joints in bell and spigot pipe on account of the preponderence of this type of joints.

The following list comprises the tools required for repairing bell and spigot joints in cast iron pipe:

1 track chisel.
2 cold chisels, ¾ in. by 7 in.
2 diamond points, ¾ in. by 6 in.
1 2-lb. machinist hammer.
1 2½-lb. calking hammer.
1 lead pot.
1 set pipe jointers for each size of pipe.
1 3-in. trench pump with 15 ft. of hose.
1 No. 1 yarning tool.
1 No. 2 yarning tool.
1 No. 1 calking tool.
1 No. 2 calking tool.
1 No. 3 calking tool.
1 No. 4 calking tool.

Additional tools, such as picks, shovels, wrenches, etc., are usually available, so that it is hardly necessary to include them in the above list. It is advisable to keep in stock a few pipe clamps for quick repairs, as a split or hole in the pipe can be repaired in a few minutes with a clamp of this kind. Lead, rubber or leather may be used as a gasket. A clamp of this kind makes a permanent job and will last as long as the pipe. If an iron clamp is not available, temporary repairs may be made by using a wooden clamp. Pits or holes in pipe may often be repaired by tapping out and plugging the hole.

The majority of underground leaks will occur in lead joints. The advantage of a joint of this kind is that it can usually be repaired by recaulking. Lead wool can frequently be used to advantage for making repairs, especially in wet trenches or on submerged mains where it would be difficult to use hot lead.

When repairs are made to leaking pipe lines every effort should be exercised to make permanent repairs. There are too many cases where the same leak is repaired time after time, causing a continual expense, where a study of the cause of leakage would often permit of applying corrective measures that would eliminate the expense of repairing such leaks for all time.

The most persistent leaks are those occurring in pipe lines laid under tracks and caused by the vibration and shock of passing trains. This trouble may be corrected by supporting the track so that the weight does not come on the pipe. The method to be followed will depend upon local conditions and may consist of placing the service pipe within a larger pipe or a concrete box. In extremely soft, marshy ground it may be necessary to provide a trestle similar to a standard ballast deck trestle as shown in the accompanying cut. There may be those who will question the advisability of incurring the expense of such protection for pipe lines, for we are inclined to overlook the importance of these water mains because of the fact that they are underground, but if they were brought to the surface the realization of their condition and the cost of the wasted water would justify considerable expense for proper maintenance and protection.

Committee: C. R. Knowles (I. C.), chairman; J. H. Grover (A. T. & S. F.), J. Mellgren (C. & N. W.).

DISCUSSION

The discussion of this report dealt chiefly with the methods which should be employed in pouring and calking lead joints. James Dupree (C. M. & St. P.) brought out the fact that one important factor contributing to the development of bad, and therefore sooner or later, leaky joints was that the work was hurried too much. He urged that ample time should always be given to such work, since leaks, in addition to being difficult to detect, were generally expensive to repair. He stated that approximately 95 per cent of the leaking joints occur on the top of the joint and that this was due usually to improper pouring and calking. In pouring the lead the air often bubbles up through it, causing the formation of blow holes, particularly in the region of the gate. For that reason the gate should never be cut off with a cold chisel but should be worked into the bell with a calking tool.

In reply to Mr. Dupree, E. A. Demars (O. S. L.) stated that it is not always blow holes on the top of the joint that cause leaking, neither is it poor calking. In his opinion, a very important cause is the vibration set up in the pipe line by the passage of trains, and this occurs wherever pipe lines are laid either under or in the vicinity of railroad tracks. This vibration causes the bell of the pipe to pound down on the calked joint, gradually thinning the lead until it reaches a condition where it fails from pressure within the pipe and a leak develops. He said that this will occur in many cases even where the greatest care has been exercised in performing the calking.

C. R. Knowles (I. C.) remarked that the discussion had made out a good case against poorly made joints and urged that it should be limited to joints properly made. He did not consider that a joint had been properly made when it became necessary to drive the gate into the bell with a calking tool. The driving in of the gate was necessary because of the presence of blow holes in the metal at the gate, and this was evidence of improper pouring. He emphasized the necessity of giving more and closer attention to the securing of a correct flow of metal, stating that a rate of flow that is too fast or too slow invariably results in trouble. By close attention to the work the correct rate can be ascertained and a proper joint obtained.

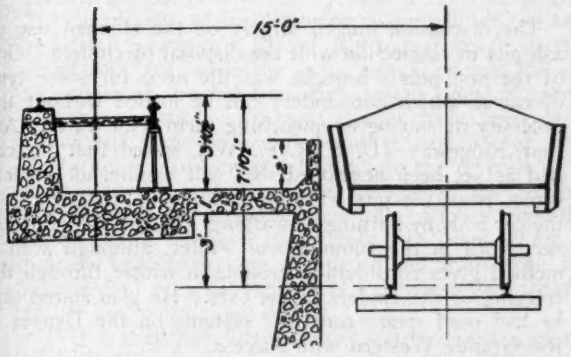
E. L. Sinclair (C. M. & St. P.), speaking on this point, stated that a pipe line had not been laid in a finished manner until it had been thoroughly tested for leaks as laid. He described a method which he had followed in which the end of the line or a section was capped and a pressure of about 100 lb. built up in the line by a portable air-compressor. All joints were then swabbed with soapy water, after which the line was examined for leaks, their presence being manifested by soap bubbles. Wherever any leaks were detected the joints were recalked and the proceedure repeated until the line could maintain the pressure for a period of 24 hours with only a small loss. He added that a line laid in that manner about three years ago was only now beginning to show signs of leaks.

On this same point Mr. Demars cited an instance where leaky joints had developed in a pipe line laid in marshy ground which, because of its nature, permitted a vibration to be set up from the pulsations of the contained water. This resulted in loosened joints and bad leaks. The condition could not be remedied by timbering or other similar methods and it became necessary to devise a clamp that would draw up the joint tightly. In answer, Mr. Knowles stated that surging or water hammer could not be overcome but could only be released through the medium of relief valves or air chambers. Responding to a query regarding concrete joints, he said that they had never been used very extensively because such construction was too rigid and contained no provision for deflections. The best method so far employed for a concrete joint, he pointed out, was to make two alternate layers of yarn and cement, closing with a trowel.

THE CONSTRUCTION AND MAINTENANCE OF CINDER PITS

AFTER COMPARING the plans of a large number of roads it was found that there really exist only the following types of pits.

A. Depressed track pits where ashes are loaded into cars by hand.



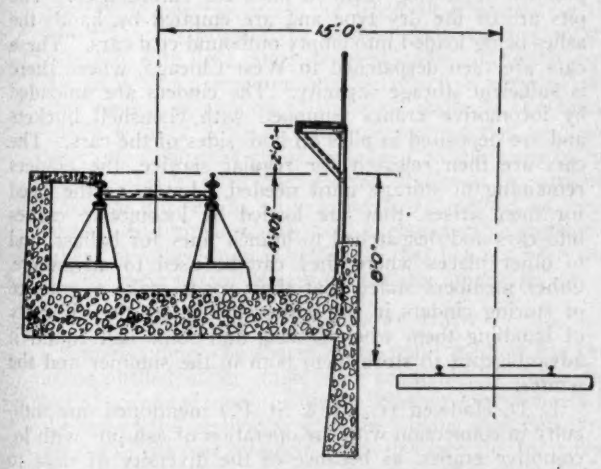
Type A Standard Cinder Pit, D. M. & N., Proctor, Minn.

B. Dry pits where ashes are received in cast iron buckets and loaded into cars by means of an overhead crane.

C. Water pits, both shallow and deep, where ashes are removed by clamshells operated by a locomotive or overhead crane and loaded into cars.

D. Miscellaneous pits, where ashes are removed by various mechanical means.

Type A, as constructed on the Duluth, Missabe &

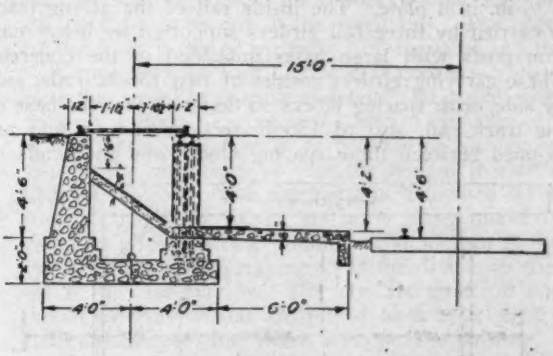


Type A Cinder Pit With Two Rail Pedestals

Northern, was built with one rail resting on the back wall of concrete and the other rail carried on two 10-in. channels back to back with a cover plate top and bottom, these channels being supported by cast iron pedestals on 7-ft. centers. This type of pit has the disadvantage that the action of the hot cinders and water on the top and face of the back wall have caused it to crumble and produce an unsafe bearing for the rail. No trouble has been experienced with the cast iron pedestals, and with a reasonable amount of cleaning of the hot cinders away from the steel beams, they do not buckle. The beams require cleaning and painting every spring and fall. The back wall can be protected with old plates ¼-in. thick hung over the edge of the back wall on the inside of the pit and down the pit about 3 ft., leaving an air space between the cinders and the concrete. This will prolong the life of the back wall.

A modification of this type provides for a deeper pit with both rails supported on cast iron pedestals with a concrete slab between the rail and the back wall; this design keeps the rail off the concrete wall and leaves the beams and pedestals exposed where they can be replaced in a few minutes, if a failure should occur.

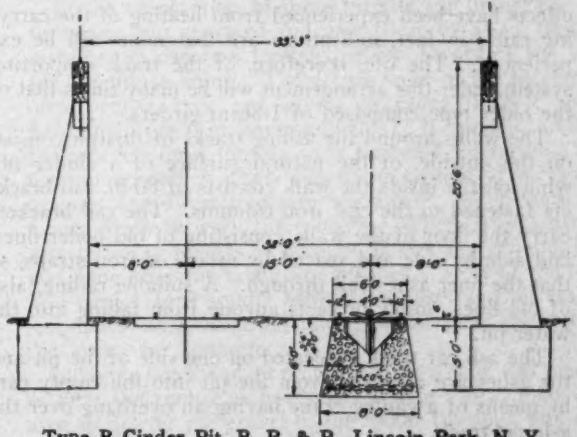
A further modification of this type as built on the Bangor & Aroostook provides for the bottom of the pit to slope from the back wall to the center of the pit; the beam carrying the track is made of two 70-lb. rails placed upside down to support the track; the pedestals are spaced 6 ft. ⅜ in. between centers and are built of two 70-lb. rails back to back on end and encased in concrete,



Type A Cinder Pit, Bangor & Aroostook

the concrete being protected by a ⅛-in. steel plate; these vertical rails are supported by two 70-lb. rails running lengthwise in the foundation.

Typical of pits of type B is the design of the Buffalo, Rochester & Pittsburgh at Lincoln Park, N. Y., which seems to be a favorite form of construction for a dry pit in cold climates. This style of pit is constructed of a series of cast steel buckets placed in shallow pits to receive ashes direct from locomotives. There is enough depth provided under the buckets to allow for drainage. The buckets are handled by means of an overhead crane from the pit directly to the ash cars. The pits are of an unusual shape with sloping sides in the upper part and

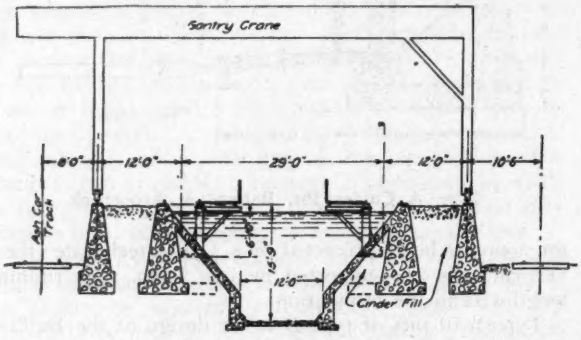


Type B Cinder Pit, B. R. & P., Lincoln Park, N. Y.

a narrow rectangular lower portion, old rails being imbedded in the sloping surfaces with their bases projecting ⅛-in. from the surface of the concrete; each parapet wall is capped with a 12-in. channel to which the track rail is bolted. The buckets have a capacity of 2 cu. yd. each, each seated on the projecting rails of the pit walls. When

the buckets are filled the traveling crane carries them to the cinder cars where they are dumped automatically. The buckets open at the bottom like a clam shell, the two halves being carried by a pair of scissor levers at the middle.

The Lehigh Valley has two modern water ash pits, both being built within the last three years. The one at Coxton, Pa., is a double-track arrangement, 400 ft. long with a water pit between the two tracks. The water pit is 12 ft. wide in the clear by 14 ft. 3 in. deep, the ash tracks having 29-ft. centers. The water in the pit is generally within 1 in. of the bottom of the carrying rails, so that it is impossible to overheat or burn any part of the supporting structure. The outside rail of each ashing track is carried on the outside concrete wall of the pit, bearing on a ½-in. iron plate. The inside rail of the ashing track is carried by three rail girders supported by heavy cast iron posts with large bases imbedded in the concrete. These carrying girders consist of two 136-lb. rails, side by side, with spacing blocks so designed that the base of the track rail, also of 136-lb. section, rest on and are gripped between these spacing blocks and the heads of



Type C Cinder Pit, Lehigh Valley, Coxton, Pa.

the two lower carrying rails, forming when tightly bolted together 3 rigid 3-rail carrying girder.

Formerly 18-in. I-beams were used to carry the inside track rails; however, experience with them has been very unsatisfactory, as hot ashes falling upon them soon warp them out of shape, rendering them unsafe. The latest design seems ideal from every standpoint and no bad effects have been experienced from heating of the carrying rails; in fact, indications are that none will be experienced. The life, therefore, of the track supporting system under this arrangement will be many times that of the older type composed of I-beam girders.

The walks around the ashing tracks of this pit consist, on the outside, of the natural surface of a cinder fill, while on the inside the walk consists of 80-lb. rail brackets fastened to the cast iron columns. The rail brackets carry the floor of the walk, consisting of old boiler flues, laid side by side and spaced by means of iron straps, so that the finer ashes fall through. A suitable railing, also of old flues, amply protects anyone from falling into the water pit.

The ash car track is located on one side of the pit and the ashes are removed from the pit into the empty cars by means of a gantry crane having an overhang over the ash car track.

The Pere Marquette reports having installed a mechanical pit in January, 1912. From recent reports the pit and conveyor are in good shape with very little maintenance. There are two good points in favor of the mechanically-operated pit. It requires less room, due to cinders being loaded continually into cars; and it requires but one man to operate it, which makes for a low operating cost. The structural steel in these pits should be inspected, cleaned and painted frequently.

Committee: G. K. Nuss (D. M. & N.), chairman; C. L. Beeler (N. Y. N. H. & H.), Wm. Cardwell (W. T. Co.), H. A. Gerst (G. N.), W. L. Rohbock (W. & L. E.), F. E. Schall (L. V.), E. K. Wenner (L. V.), J. P. Wood (P. M.), A. E. Kemp (L. V.).

DISCUSSION

The discussion hinged largely on the efficient use of ash pits in connection with the disposal of cinders. One of the first points brought was the need for some type of car in which hot cinders can be loaded without the necessity of cooling or quenching them with water. Arthur Ridgeway (D. & R. G. W.) stated that no car had as yet been developed that will handle hot cinders direct from the pits without resulting in destruction of the car body by burning or warping. Quenching is necessary both in the summer and winter, although such a method gives considerable trouble in winter through the freezing of the cinders in the cars. He also stated that he had used steam conveyor systems on the Denver & Rio Grande Western with success.

E. L. Sinclair (C. M. & St. P.) brought up the question of storing cinders in the winter, in reference to which J. L. Pickles (D. W. & P.) said that he had stored cinders for variable periods, but chiefly as a result of the failure of the pits, and that this had resulted so satisfactorily that he was now contemplating the construction of a raised track for the purpose of facilitating the continuance of this practice. The subject of storing cinders was carried farther by J. S. Robinson (C. & N. W.), who stated that at the Chicago terminal of the Chicago & Northwestern they had regularly made a practice of storing them in piles for future uses. The pits are of the dry type and are emptied by hand, the ashes being loaded into empty outbound coal cars. These cars are then despatched to West Chicago, where there is sufficient storage capacity. The cinders are unloaded by locomotive cranes equipped with clamshell buckets and are deposited in piles on both sides of the cars. The cars are then released for regular service, the cinders remaining in storage until needed. Later, as the need for them arises, they are loaded by locomotive cranes into cars and despatched to branch lines for ballast, and to other places where they can be used to advantage. Other members stated that their roads make a practice of storing cinders in the winter to obviate the difficulty of handling them when frozen, and some had found it advantageous to store them both in the summer and the winter.

L. D. Hadwen (C. M. & St. P.) mentioned one difficulty in connection with the operation of ash pits with locomotive cranes, as because of the diversity of uses to which they could be put they were often taken away for use out on the line, with the result that the cinders pile up in quantity and, in the winter time, freeze into an almost unmanageable mass.

In commenting upon the subject of pit construction, Mr. Robinson stated that the road with which he was connected had found it necessary to cover the pedestals supporting the running rails with concrete to prevent a too-rapid burning out of them. In addition to this protection, it had been necessary to protect the concrete from disintegration by covering it with boiler plate, a method of protection that had been extended to include the sides of the pits also. Responding to a question regarding the probable use of concrete girders, R. H. Helick (Penna.) and J. P. Wood (P. M.) stated that they had constructed pits, the former using reinforced concrete girders and the latter using concrete-covered

I-beams to support the running rails, and in both cases the construction had been a failure. In the latter case, the concrete had burned off and the steel had buckled.

LINING TUNNELS UNDER TRAFFIC

THE REASONS for lining a tunnel depend largely on the conditions surrounding it. A timber-lined tunnel, no matter how short, located on a busy trunk line at a point where detouring is prohibitive, or badly restricted, presents a hazard which may result in enormous cost, for while the earth formation may be such as to give no trouble from compressed sides or upheavals, there is the ever-present danger from fires, derailments and loads fouling the timbers, any one of which might delay traffic enough to cut into the revenue of the road seriously. Many of the tunnels on the Southern Pacific Lines are bored through hills of loose formation, which, when released, runs freely. In cases where the timbers have been torn or burned out, this loose rock and sand at once fill the tunnel, carrying other adjacent arches and posts along with it.

Wet tunnels have been another source of annoyance on many lines. In some instances where tunnels have been bored with the intention of leaving them unlined, depending upon the stability of the rock, it has been found necessary to timber them finally and line them with concrete, due to the slacking of the rock face or to the slipping of the inclined strata.

The kind of lining selected upon differs somewhat on various roads. Some roads deem it advisable to line with concrete only, others use concrete back walls and brick facing.

The concrete lining has proven the most economical to install, especially with the present day methods—the pneumatic process being the latest development in this line. By this process the work may be carried on successfully with little interruption to traffic and to the work. There is also a machine now by which a grout of sand and cement is applied to the rock walls of the tunnel, either with or without reinforcement as the conditions warrant. Thus the grout is sprayed on the walls in successive layers until the desired thickness is attained. This has proved to be a satisfactory method of lining rock-faced tunnels where there is considerable seepage or where decomposition is setting in, but has not been used to any great extent in railroad tunnels otherwise.

LINING TUNNELS BY HAND

Lining tunnels by the so-called hand method has been accomplished under traffic very economically under favorable circumstances. This is done in long tunnels by the use of the jumbo car with the staging high enough to permit of the concrete being shoveled into the form from this elevated platform. In some cases the side walls are poured ahead a considerable distance and the arch brought up later; in other cases the entire form is filled at one pouring, making a complete monolithic section. The difficulties encountered in this method are generally caused by the interference with the work by traffic, making the work spasmodic and creating an economical loss, which can be overcome only by the strictest supervision and the employment of a small crew of men.

Where short tunnels are to be lined the hand method is probably the most practical. The staging can be erected high enough to give safe clearance for trains and also to give room enough to work. A continuous staging is thus carried along from the mouth of the tunnel and the concrete is conveyed from the outside of the tunnel to the form in one-yard mining cars which operate on a track laid in the center of this continuous staging.

On the Southern Pacific, in some instances, a 4-ft. by 5-ft. drift has been opened over the top of the tunnel timbers, where the earth formation was favorable, a track laid on the tunnel timbers and the concrete carried into the form in dump cars. In this case the form can be poured to the top with little shoveling.

Wooden forms, constructed of 3-in. by 8-in. studs, spaced 2 ft. on centers with 1-in. by 6-in. sheathing, and in 12-ft. sections, are used. The form arch is hinged to the wall of the form with plates and bolts so that, to move the form ahead, it is only necessary to draw the side walls in and lower the arch enough to clear. Then the entire form is pulled ahead as far as necessary on pipe rollers and reset for filling. Walling pieces of 4-in. by 6-in. pine at the middle and top of the side walls are tied back by wire or bolts to the tunnel timbers, and the foot of the form is braced to the track ties. The open end of the form is closed up with 1-in. material and braced.

A spur track of four or five cars capacity is put in as near the tunnel as possible and sand and gravel unloaded on a plank floor. The cement house of two cars capacity is located as conveniently as possible to the mixer and also on the spur track so that the cement is handled as little as possible. The aggregate is hauled in wheelbarrows to the ½-yd. mixer, and after being mixed is elevated by a tower to the dump cars, which are at the elevation of the tunnel staging or to the drift over the tunnel as the case may be. The cars are then run into the tunnel by gravity and are pulled back by a light cable from a donkey engine, which also does the hoisting. This work is carried on with 20 men and averages about 36 ft. per week with a single shift.

LINING TUNNELS BY THE PNEUMATIC METHOD

The Southern Pacific has now practically adopted the pneumatic method for the lining of its tunnels under traffic. The first piece of work of this nature consisted of enlarging to standard size and lining with concrete the tunnels on the Tehachapi Pass and the San Fernando tunnel, all of which are located on the single track main line between San Francisco and Los Angeles. On the 18 tunnels on the Tehachapi section, 11 were lined throughout by the pneumatic process, 2 were eliminated by a line change, 4 were lined by the hand method, being short jobs, and 1 was simply enlarged and not lined for the reason that it was of solid rock section throughout.

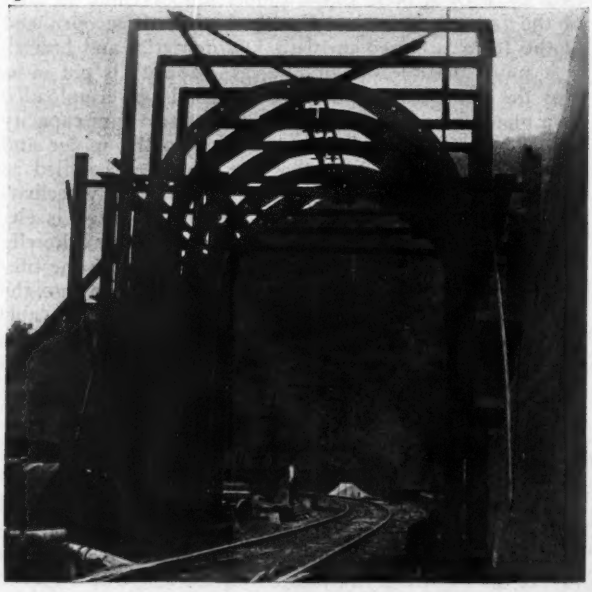
In the preparation of these tunnels for lining, the old timbering was removed and new 10-in. by 14-in. timbers installed on concrete footings, which furnished the base for the future lining. The arches were of the three-segment octagon type, and gave a clearance of 23 ft. overhead and 19 ft. 6 in. horizontal for 17 ft. tunnels. All of the concrete-lined tunnels were timbered throughout and the timbers left in place with the exception of spreaders or girts and all unnecessary woodwork, which were removed from between the timbers. Where it was necessary to install inverts on account of swelling ground, this was done after the lining was finished. Most of the tunnels were lagged solidly behind the posts and all cracks and holes were battened and plugged prior to setting the forms for concrete.

In laying out the plant on the outside a spur was placed as near the tunnel as possible. Where a drag line was used to deliver the gravel to the mixer the spur was elevated four feet to give room to handle bottom dump cars, but where a clam shell was used it was not necessary to elevate the track as the cars could be unloaded by the clam shell.

Three different methods were employed to convey the gravel to the mixer. Wheelbarrows were first used, wheeling the rock and sand separately to a dipper, which

was hoisted by a small air motor. This required a fleet of eight wheelbarrows and six shovelers to keep gravel at the mixer and considerable lost time was experienced by this method. Besides these men it required eight more men to unload gravel from the cars.

To overcome this expensive feature a 25-yd. hopper was built over the mixer and a bucket elevator was installed at an expense of $700. The elevator was operated by air; it required only seven men to keep the hopper full, and there was no delay in getting gravel to the mixer. The spur track was also elevated and five men kept the cars empty. The gravel and sand were then delivered ready mixed in proper proportions. This elevator paid for itself quickly and this method was later



Steel Forms of Collapsible Type Were Used

improved upon by pulling the gravel up to the elevator with a drag line from a donkey engine. Three men now furnished gravel to the mixer and five men from the bull gang kept the cars empty.

Later on when a locomotive crane was available it was used to handle the gravel and proved to be the most economical of all, as with this crane the cars could be emptied and gravel supplied to the mixer with the use of only three men. Besides this, the crane was a great labor saver in setting up the plant, loading and unloading material, etc.

The cement house was placed adjacent to the mixer and also close to the spur track, so that cement could be handled easily, both from the car and to the mixer. A three-car capacity cement house proved ample for the work.

The machine used for placing the concrete lining consists of a cone-shaped hopper with a trap door at the top and a cast iron elbow at the bottom or apex of the cone. The hopper is built of ¾-in. steel plates and in ¼-yd. size. The machine was located as near the gravel storage as possible. Over the mixer a 25-yd. hopper 10 ft. square was built in sections so that it could be taken down and moved easily. The gravel is drawn from this hopper through an air-operated gate at its lower point into a ¼-yd. measuring hopper and thence into the mixer. This is done quickly and it required but a few seconds to load the mixer with the charge.

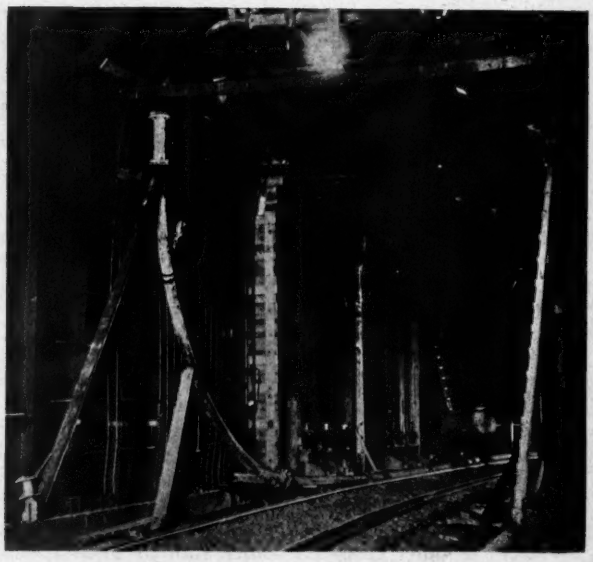
The compressor was of the Ingersoll-Rand Imperial Type 10, having a capacity of 925 cu. ft. per minute. It was belt driven by a 320 hp. gas engine. Both engine and compressor were installed in a steel frame box car in order to make them portable as the conditions demanded. The car, when located in a suitable place, was lifted from its trucks and rested on wooden frame bents on concrete. The car was braced at each end with I-beams to the rails, which, with 18-in. screw jacks, took up the thrust of the car when the engine was working.

Two 3-in. pipe lines carried the air from the compressor to the mixer, and the air storage consisted of small tanks with a total of 400 cu. ft. capacity. This capacity was ample for a shot of 1,200 ft. and was reduced to 140 cu. ft. for the shortest shot of 250 ft.

As this entire plant was to be used at all tunnels over 200 ft. in length, it had to be made portable, and it generally required seven 8-hr. days to set it up and the same length of time to prepare 100 ft. of tunnel and set up the steel forms ready to fill, with a force of 40 men.

Five steel ribbed forms of the Blaw collapsible type were used, each form being 20 ft. long, and covered with 3-in. pine lagging. All forms were set up outside the tunnel and rolled in on their own wheels, on a light rail spaced 25 in. from the face of the concrete on either side, and 3 in. below the top of the main line rail. The forms were spaced in the tunnel so that they would operate toward each other, the intention being that all forms should cover the discharge pipe.

From the mixer a 6-in. standard steel pipe was laid into the tunnel. The pipe was connected with 6-hole cast iron flanges, and extra heavy pipe was used for bends. The pipe was laid on the ground to a point midway between two forms where it arose to the top center of the tunnel through the extra heavy bends. It was then carried on hangers in the top of the tunnel. By reversing one elbow two forms could be shot with one set-up of the pipe. The same procedure was followed with the other two forms, but the fifth form required a separate set-up of pipe. As two forms were filled the ground connections of the pipe were changed and the next two filled. This could be done in 30 minutes at least and when no delays occurred shooting could be resumed in the next form in that length of time. The pipe was anchored to the timbers with chains and turnbuckles, as the thrust



Forms in Readiness for Concreting

was very severe at times, and it would break at the flanges quickly unless so anchored.

On the end of the pipe at the form a 6-ft. nozzle, consisting of extra heavy 6-in. pipe, with a slight curve in it, was flanged on. This deflected the concrete to the side walls until the concrete arose to the crown of the arch on each side. It was then removed and a straight pipe put in to finish the key of the arch.

One-half inch steel plates were used as baffle plates on the timbers to keep them from being cut through by the concrete, and were removed when the concrete reached that height. It was also necessary to put steel sheets 4-ft. by 10-ft. by 1/16-in. thick on the forms where the concrete struck, otherwise the lagging became rough and caused trouble. Care was taken to keep the forms well cleaned and oiled to prevent sticking. The forms were cleaned by air. A 1-in line laid through the tunnel from the air reservoir furnished air for this purpose, and, with a hose and short pipe nozzle, the loft man could keep the form clean by blowing all loose rock and concrete off when necessary.

The discharge pipe gave considerable trouble in the early stages of the game through wearing out at the bends, but this was overcome by case-hardening and on heavy patches with clamps. In this manner 1,000 to 1,500 cu. yd. could be shot through a bend before it became useless.

The forms, when placed, were raised and spread by screws attached to them, but it was necessary to block the form ribs up well and tie the forms back to the tunnel timbers with ¾-in. bolts at the center and at the spring line. The foot of the form was braced to the track ties and it was found that considerable bracing and tying was necessary to hold the form in place successfully on account of the rapidly increasing weight as the form was filled, for the concrete was practically alive until the entire side was filled. Many times it was found necessary to allow some time for setting by changing the pipe from one side of the form to the other side, where the tunnel was only partially lagged up back of the timbers or where large cavities occurred. An electric bell with a code of signals was used to advise the mixer operator when to start shooting and when to stop, and to give him other necessary information as to the progress of filling the form. The concrete placed by this method was found to be well mixed and of a good quality when crushed rock of 1 in. to 1½ in. size was used with clean sand, but round rock and pebbles did not do as well, as they had a tendency to roll into pockets, which sometimes caused considerable trouble.

It was found necessary to have a man patrol the line with a hammer, as the concrete stuck in the pipe frequently and had to be hammered loose. In the long tunnels two or more men were necessary in order to prevent delays on this account. In an effort to overcome this sticking or plugging and to give more plasticity to the concrete, hydrated lime was added to the batch. One-quarter of a cubic foot was added to each ¼-yard batch, but no improvement was noted, and the only remedy seemed to be to add more water. Under these conditions the sticking was very much minimized, but it became much harder to hold this excess fluid in the form, though the quality of the concrete appeared to be as good or better than with the dryer mix.

The concrete was reinforced with ¾-in. twisted or deformed steel bars spaced 12 in. on centers for the vertical steel and the arch, and 24 in. on centers for the horizontal steel. Twisted steel plugs were left protruding 9 in. out of the concrete footings, when built, to tie to, and all the steel was securely tied with No. 14 annealed wire.

The aggregate was furnished in 1:2:4: proportions and was put into the mixer dry, and 10 to 12 gal. of water added. Everything was arranged so that rock, sand, cement and water could all go into the mixer at once. When shooting from 150 ft. to 200 ft. as high as 96 batches per hour were handled for distances of 700 ft. to 800 ft., 60 batches per hour, and at 1,200 ft., 45 batches.

To operate the plant successfully sufficient water should be on hand. In these tunnels water was taken from a 6-in. gravity line by installing a valve. This, with the addition of a 2,000-gal. tank, elevated 60 ft. above the plant, gave sufficient pressure for the engine and mixer, as well as for camp and other purposes.

To shoot the concrete successfully it was found necessary to maintain an air pressure of from 75 lb. to 90 lb. in the receivers. When shooting at 80-lb. pressure a drop of 20 lb. occurred before the batch was entirely discharged. This varied with the distance from the mixer to the form, but the maximum variation with the 400 cu. ft. air receivers was 30 lb. when shooting a distance of 1,200 ft.

A Finished Section of Lining

As the lining progressed and the two forms approached each other from 10 ft. to 14 ft. was allowed as a finish form. This form was finally filled through a 2-ft. by 4-ft. recess left in the top and end of the last section of concrete. Through this hole the pipe was inserted and the hole was big enough for the loft man to crawl through to clean the form. When the form was filled the pipe was pulled out and this recess reinforced and filled, completing the work.

The forms were then rolled out and in one case were hauled intact to another tunnel a mile distant by work train with no delay to trains and all in five hours. Otherwise the forms had to be dismantled and knocked down to move to the next job.

As in all concrete work, continuous pouring of a unit produces the best results, so in tunnel lining a section should be completed in the shortest time possible to avoid seams and offsets in the concrete. It was therefore found most practical to work two 8-hr. shifts, one shift starting at 6 a. m. and working until 3 p. m., and the other shift continuing on from 3 p. m. to 12 o'clock midnight, taking the usual hour for lunch. In this way a section of 20 ft. could be completed each day.

After completing the section and making another

form ready the night shift changed the pipe and did what other work was necessary for the day shift to start promptly after 6 a. m. on the work of placing concrete.

Six 20-ft. sections were completed each week with the double shift and in some cases of short shooting seven could easily have been blown, but the lack of forms and the four days required for setting of the concrete, made it impossible to complete seven sections in six days.

The forms varied somewhat in the amount of concrete necessary to fill them. This variation was due to the nature of the lagging in the tunnel. Some portions of the tunnels had no lagging where good rock was encountered and in these instances the concrete filled all cavities and voids in the rocks and, of course, required more filling, as it was not considered practical to fill these voids other than with the concrete. Some 20-ft. sections of this nature required from 90 yd. to 105 yd., but the ordinary section, where timbers were well lagged, required an average of 80 yd. or 3.5 yd. per tunnel foot.

A crew of 40 men was used on the day shift, consisting of a foreman and two assistants, 16 carpenters, an electrician, an engineer and helper, a pipe man and helper, a craneman, timekeeper, 3 flagmen and 12 laborers. The night shift was composed of 20 to 25 men, consisting of the foreman, an assistant, 8 carpenters, an electrician, an engineer and helper, a craneman and 6 or 8 laborers. As the day crew did the bulk of the work, the night crew was not necessarily as large, as it was considered practical to start blowing a new form and let it set unfinished for six hours.

The cost of lining these tunnels varied somewhat owing to conditions on the ground, the fluctuation in wages and the uncertainty of delivery of material, during the 57 months that the work was in progress. Costly delays were experienced through labor shortage and lack of material delivery. During the time that this work was in progress the weather conditions were favorable, there being little snow and frost to contend with as on other jobs in colder climates.

The cost of lining a typical tunnel 684 ft. long (Tunnel No. 3 of the series on the Tehachapi Pass) lined by the pneumatic method is reflected by the following figures. In this case a spur track of 4-car capacity was provided. Material was supplied to the job by a very irregular local train service. Considerable delay was caused through lack of material delivery from a commercial plant located 200 miles from the tunnel. The work was done during a period of extremely high wages, carpenters and mechanics receiving as high as 83 cents and laborers 51 cents per hour. One shift of 8 hours only was used and the gang consisted of about 35 men. Gravel was delivered to the mixer by a drag line and elevator, which was somewhat costlier than handling by the crane, as was done on later jobs. The entire cost of concreting this tunnel was $31 per lineal foot for labor and $33 per lineal foot for material.

The work was carried on by company forces. George Rear, bridge engineer for the Southern Pacific Co., was in general charge. A. Fraser, supervisor of bridges and buildings at Bakersfield, supervised it, and the writer executed the job of lining.

The report was accompanied by a detailed description of the lining of the San Fernando tunnel on the Southern Pacific near Los Angeles by the pneumatic method. Two novel methods of lining tunnels on the Lehigh Valley were also described, one of which involved the sinking of a shaft from the top of the ground above the tunnel to the top of the old brick arch, the building of a second arch and side walls around the whole of the original tunnel and the destruction of the original lining, while the second involved the substitution of a cast iron lining for a brick arch which had disintegrated. Detailed descriptions were also presented of the method which is now being followed in lining the Connaught tunnel through the Selkirk mountains on the Canadian Pacific and that followed at the St. Paul Pass tunnel of the Chicago, Milwaukee & St. Paul in the Cascade mountains.

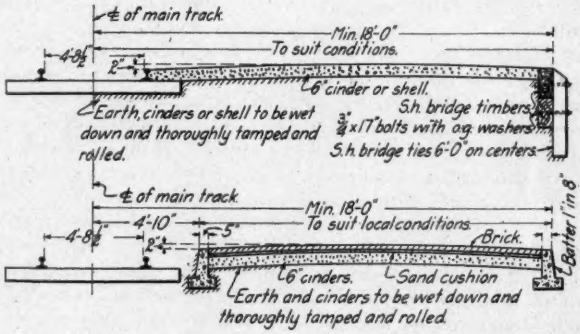
Committee: W. C. Harman (Sou. Pac.), chairman: M. M. Corrigan (B. & O.), James Gratto (Sou. Pac.), George W. Rear (Sou. Pac.), A. Ridgway (D. & R. G.), H. B. Rivers (C. M. & St. P.).

DISCUSSION

In the discussion of the report, reference was made to an article entitled Virginian Builds Double Track to Relieve Congestion, which appeared in the Railway Age of September 10. G. W. Andrews (B. & O.) also incorporated in his discussion an article entitled An Organization for Tunnel Maintenance, which appeared on page 285 of the August issue of the *Railway Maintenance Engineer*, this article describing the form of tunnel organization which the Baltimore & Ohio had developed to handle the maintenance of its tunnels and traffic.

THE CONSTRUCTION AND MAINTENANCE OF PASSENGER PLATFORMS

WHEN A new platform is to be built or an old one replaced the first problem is to determine the kind of material to use. There are many kinds to chose from, including concrete, brick, asphalt or mastic, asphalt blocks, wood, crushed stone, gravel, cinders, chats, etc. While most platforms may become slippery in freezing weather, those with a perfectly smooth and hard surface become slippery much more readily than others and for that reason alone some types of platforms that are perfectly satisfactory in southern localities are not suitable in areas



Types of Cinder and Brick Platforms, K. C. S.

where there is much freezing weather. Baggage and express handlers complain that when working on hard and smooth platforms the trucks move too easily while standing at express and baggage car doors. At the same time platforms with a very rough surface are objectionable when heavy loads must be trucked over them.

The kind of platform finally decided upon depends upon the following factors: 1, traffic; 2, service life; 3, availability of material; 4, appearance; 5, cost, and 6, the relationship of these factors to the location.

FILLED PLATFORMS

For convenience the committee uses the term "Filled Platforms" to designate those that are made with a top surface of cinders, gravel, stone screenings, shells, chats or other suitable material which is merely compacted by tamping or rolling. These are built both with and without curb.

There are some locations, especially at wayside stations, where there is no trucking and at which a filled

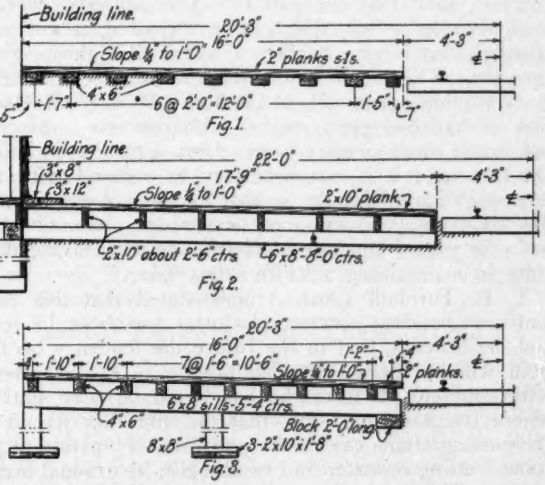
platform without curb can be used. Something will depend upon the ground surface and the drainage, but usually a platform of this kind, if carefully built to begin with, will give very satisfactory service with very little maintenance expense for many years. Bad spots will develop from time to time, especially in wet weather, but they are easily repaired. As a rule, platforms of cinders or stone screenings are objectionable when much trucking is done, especially in the spring of the year when the frost comes out, when they are also objectionable because of the dirt that is tracked into stations and coaches by passengers.

The usual method of constructing these platforms is to excavate to a level grade about a foot below the base of rail, put in a six-inch layer of broken stone or cinders and on this six or eight inches of screenings, shell, chats or other finishing material. This is thoroughly rolled or tamped, making a hard, smooth surface.

Most platforms of this kind are built with a curb of wood, stone or concrete. Sometimes this curb is placed only on the side opposite the track, at other times on the track side, and again on all sides. The curbs used vary considerably in design, but in the main are much like those used in connection with brick and concrete platforms.

Wooden Platforms

Although wooden platforms were almost universally used about 30 years ago they are now disappearing rapidly except in localities where timber is plentiful and cheap. The cost of lumber has made the wood platform comparatively more expensive in recent years and has led



Three Types of Wooden Platforms

to the use of other materials from which a longer service life can be expected.

In localities where wooden platforms are still used it is found that there has been no change in practice in recent years. The usual types are three in number. The first includes plank laid on sleepers resting on the ground and is usually employed in dry localities or for temporary installations. The life of such a platform is rather short, varying from 3 to 5 years, and is usually only warranted to take care of a temporary need. In the second type planks are laid on joists that rest on sleepers embedded in the ground. This platform gives somewhat better service because there is an air space under the floor for ventilation, which keeps the floor and joists comparatively dry. The sleepers in this style of platform rot quickly and it might be worth while to make them of treated timber. In the third type the flooring and joists rest on stringers, which in turn are supported on blocking or posts. This form of wood platform gives the best service, lasting from eight to ten years. Instead of wood posts, more permanent supports of brick or stone can be used.

The floor of a wood platform soon shows the wear of trucks and traffic and it is not long before it becomes uneven. It is rather difficult to keep a wood platform in good appearance. Broken or worn plank replaced by new look bad and are apt to form stumbling blocks for passengers. This is one of the main objections to the wood platform.

Concrete Platforms

It was rather surprising to the committee that concrete is not used more generally for station platforms. A station platform is subject to more severe use than sidewalks or highways because of the use of trucks with iron wheels and the need frequently of handling heavy freight over it in addition to baggage and express. In some cases it is not long before the edges and corners begin to chip and crack and small imperfections start in large surfaces. In colder climates they are liable to injury by frost. Then, too, platforms adjoin railroad tracks and are subject to marked vibrations from passing trains.

There are many instances of concrete platforms that are giving excellent service, although as a general rule they are more successful in warmer climates. As has been brought out frequently in our reports and discussions there is no form of construction that requires more care and skill than the application of concrete, and it will be found that many imperfections can be traced directly to some error or lack of care in workmanship. One trouble with the concrete platform is the difficulty of making repairs. For this reason it is apt to be allowed to stay in an unsightly condition for a long time before it is considered bad enough to require removal. In case of a change of grade a concrete platform cannot be raised or lowered, but must be broken up and a new one put down.

The C. & E. I. finds concrete to be the most satisfactory material for passenger platforms in large terminals and in larger cities where the traffic is heavy. From the standpoint of construction and maintenance this road has found platforms built to the following specifications the most economical:

"Excavate to a depth of 10 or 12 in. and put in a layer of 6 to 8 in. of cinders thoroughly tamped. (Care should be taken to see that the subgrade has proper drainage.) On the cinders lay the usual two-course sidewalk, the first course of 1:3:6 and the top of finish course of 1:2 concrete. Provide expansion joints of ½ in. every 50 feet, using an elastic saturated asphaltic felt. Platforms constructed according to the above specifications have been in service from 2 to 20 years without any maintenance expense. All concrete platforms are provided with expansion joints at the curb."

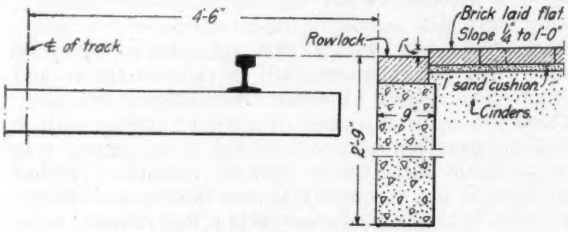
Brick Platforms

The brick platform is finding much favor and has many points to commend it. If it develops bad spots, part of the bricks are easily taken up, the foundation repaired and the brick replaced. If the grade is changed the brick can also be taken up and relaid with no loss of material. If bricks become broken they are easily replaced.

The curb and the brick laid adjoining the curb seem to be more or less troublesome. Instances are reported in which the curb has tipped outward as though too much crown had been allowed and this, in flattening out, had crowded out the curb. The only remedy suggested is the careful placing of the curb and thoroughly tamping of the earth on each side or increasing the thickness and

depth of the curb. Some also report cases in which the brick next to the curb have settled below the level of the curb, indicating that the earth next to the curb settles more than that farther away. It may also be that where a roller is used it is not easy to compact the earth thoroughly next to the curb. To overcome this trouble it is usual to lay the brick from ½ in. to 1 in. above the top of the curb.

On the Atchison, Topeka & Santa Fe a curb is used which has proven very satisfactory. It is built with a concrete base topped with a row of paving brick laid on edge in cement mortar and called a rowlock. This form of curb has a decided advantage in case of a change in grade. If the raise is only an inch or two the rowlock is removed, a bed of cement mortar is added and the brick replaced, while if the raise is more than the width of a brick an additional rowlock is placed on the old one. This is all done without disturbing the concrete base. On this road the brick for platforms are laid flat, with name



Detail of Platform Curb, A. T. & S. F.

down on a 1-in. sand cushion, over a rolled sand and cinder fill. The starting line of brick is placed one inch above the rowlock curbing to allow for settlement.

The limited use of compressed asphalt blocks for passenger platforms up to the present time is probably due to the fact that it is only in the past two years that the manufacturers have made any intensive effort to interest the railroads in their product. However, the large and successful use of these asphalt paving blocks in shops, freight houses and piers for a long period of years would indicate that this material is worthy of consideration in connection with future passenger platform installations.

Asphalt blocks are usually laid on a stiff half-inch mortar bed which has been stuck to a smooth surface over the concrete base. No expansion joints or tar filler are used. The blocks are very uniform and lay up tight and smooth without buckling, no matter what the temperature may be. The blocks produce a clean, comfortable, non-slip surface that is dustless and practically noiseless. They are acid, alkali and water proof and the normal dripping of oil incidental to daily usage is beneficial to the asphalt blocks and readily assimilated without making a spotty looking platform.

ASPHALT OR MASTIC PLATFORMS

The reports received show that passenger platforms of asphalt or mastic are not very generally used and are largely confined to the larger cities and terminals. This is perhaps due to the fact that this class of work is seldom handled by bridge and building forces, but is usually let to some contractor who makes it a specialty. The asphalt coating is about two inches in thickness and is placed on a concrete foundation. Much experience is necessary in building such a platform to make sure that this top coat will not become too soft in hot weather. As the asphalt coating is hard and smooth, it is apt to become slippery in freezing weather. Most asphalt or mastic platforms are built under shelter, as, for instance, in large train sheds, which protect them from excessive heat common to the mid-summer season.

Repairs to this form of platform are not made easily. Bad spots develop and gradually increase in size the same as in street pavements, making it necessary to tear up a portion of the top coating and put in a patch. The best patches are made with heated materials and it is usually necessary to call in the contractor who built the platform to make the repairs. There is also a cold patch process, but it does not usually result in as satisfactory a job as the hot process.

Committee: F. E. Weise (C. M. & St. P.), chairman; E. K. Barrett (F. E. C.), E. E. Allard (M. P.), R. W. Beeson (C. & S.), A. O. Cunningham (Wabash), George Dickson (S. P.), F. A. Eskridge (C. & E. I.), J. H. Markley (T. P. & W.), H Silcox (P. R. R.), F. J. Welch (C. M. & St. P.), J. J. Wishart (N. Y. N. H. & H.).

DISCUSSION

The discussion dealt chiefly with the comparative advantages and disadvantages of concrete and vitrified brick platforms. G. W. Andrews (B. & O.) stated that the Baltimore & Ohio had been gradually replacing its wooden platforms with vitrified brick and other forms of construction. Whenever a new station is built, the platforms are now made of brick, although the road still maintains many wooden platforms, chiefly on branch lines, and a result of the curtailing of the renewal program during the war period. He stated that concrete platforms had been used both at terminals and at road stations, but at the latter locations they had not given good results. Local freight trains must load and unload from or onto these platforms and, as this loading and unloading is usually performed in haste, heavy articles are dropped, shattering the surface. The shattered surface soon becomes a hole which, when repaired, is not only unsightly but is also harder or softer than the original concrete. The result is an irregular surface that soon gives trouble again. D. L. McKee (P. & L. E.) said that he had had good success with concrete platforms, but that it was necessary to put down a good foundation. On this road it is not necessary to contend with the dumping of local freight, so that he had not experienced the disadvantages mentioned previously. In connection with the use of concrete platforms, he was having difficulty in maintaining a white safety line.

T. B. Turnbull (Ann Arbor) stated that this road had been building concrete platforms for about 15 years and, he believes, that in the future the tendency on this road will be toward vitrified brick. In his experience with concrete platforms he has found, at way stations where trains do not stop, that the vibration set up by the passing trains causes the platform to separate at the joints, letting in water and resulting in its gradual breaking up. This condition had been remedied to some extent by pouring monolithic platforms. It was remarked by some of the members that they had found it bad practice to construct platforms with longitudinal seams, preferring to pour the platform solid for the full width, breaking it with construction joints at right angles to the center line of the track. Several members stated, in reference to brick platforms, that they had found them unsatisfactory in winter because of the insecure, and even dangerous, footing they present during that season of the year, and they also gave considerable trouble from settlement. It was brought out by others that the rough surface of the brick necessitated better cleaning, and that when that was done there was but slight reason for an insecure footing. J. P. Wood (P. M.) said that settlement was generally the result of an improperly prepared base. He emphasized the need of closer attention to this feature of the work and added that the fill, when made, should be allowed sufficient time to settle fully. It should then be tamped thoroughly, after which the brick can be

laid. J. J. Wishart (N. Y. N. H. & H.) stated that mastic platforms had been installed at the South Station, Boston, Mass., about 24 years ago and that they had been in continuous service since. The first repairs were made about 18 months ago.

OTHER PAPERS AND NOTES

A REPORT under the title Tool Equipment for Pile Driver Outfits was presented at the convention, this report consisting of recommendatious of the committee, of which J. A. Bowland (G. N.) is chairman, on the proper equipment for this purpose and including a description by R. C. Young of the apparatus developed for driving and pulling piles on dock work on the Lake Superior & Ishpeming, also an appendix prepared by G. W. Andrews on floating driver equipment used by the Baltimore & Ohio in harbor work. Unfortunately, lack of space has made it necessary to hold this report until the next issue.

ADDRESS BY L. F. LOREE

L. F. Loree, president of the Delaware & Hudson, spoke before the convention at the opening of its session on Wednesday morning, tracing the development of steam transportation from the earliest period of the steam engine to its present high state of perfection. He described the engineering problems involved in the construction of the Liverpool & Manchester in 1830 at some length, paying tribute to the early engineers who built this line with 60 bridges, one tunnel one and one-half miles long, and a section of four miles across marshy land which required special support. In closing, he referred at some length to the development of socialism and trade unionism in this country. He pointed to the decline of socialism in this country as well as abroad and predicted the similar decline of trade unionism, which he defined as a vast organization, in the near future. He described the characteristics of unionism as similar to those of a political organization because it has a group of paid officers, whose tenure of office depends upon their efforts. He advocated the letting in of the light as a cure for the present abuses in trade unionism, stating that he had no doubt but that a secret ballot and an honest count would defeat every strike.

TREATED TIMBER IN BRIDGE CONSTRUCTION

C. M. Taylor, superintendent of treating plants of the C. R. R. of N. J. and the P. & R., gave an illustrated talk on Tuesday evening on the use of treated timber by bridge and building forces. He stated that if the best work is to be done and the best results secured, the timbers must be framed completely in advance, then treated and shipped to the location where the work is to be performed. When this is done a satisfactory and lasting construction can be secured, the advantages to be derived being numerous and including such important factors as the lessened chances for decay, the more thorough treatment of the wood and the general speeding up of the erection. As an illustration of places where bridge and building forces could use treated timber advantageously, he cited the average small and unimportant highway overcrossing which must be maintained, yet over which there is not sufficient traffic to justify a more expensive form of construction, such as concrete. With timber framed and treated in advance, such a structure can be erected quickly, the work being purely an assembling job, and at the same time a lasting construction can be had. During this part of his talk Mr. Taylor showed numerous illustrations of highway crossings and other types of bridges, the timber for which, including decking, etc., had been framed completely in advance. In speaking of bridge stringers and other timbers of large size, he stated that they must not be cut and that it was also very bad practice to order larger or longer lengths of timber than were necessary. Piles, he said, were particularly ill-treated by being cut into for the reason that many piles have too large a butt measurement and in order to make a well-appearing and finished piece of work, they are often dapped or chamfered. The result is exposed surfaces through which decay enters to the ultimate destruction of the wood. In addition to this abuse, piles are often handled too roughly and he urged that treated timber be handled very carefully at all times, abstaining from the use of pike poles or other devices that penetrate the treated surface. He also brought out the fact that the ordering of timber, and particularly of piles, was often delayed so long that it was difficult to secure the best treatment and still make the required delivery. He emphasized the need for more consideration of this point.

The discussion which followed Mr. Taylor's remarks was chiefly regarding the advantages of treated timber in the construction of water tanks. C. R. Knowles (I. C.) stated that on the Illinois Central he was using treated loblolly and long-leaf yellow pine with good success. In constructing tanks with treated timber it is necessary to use care in erection, for the action of the water cannot be depended upon to swell them tight. The edges of the staves should be sawed rather than planed and sufficient staves should be used to fill the bottom fully. The tops can be pulled in readily and this, in connection with the rough edges left by the sawing, will insure tight joints. A life of about 30 years can be obtained easily and the cost is less than first-class untreated timber. In reference to redwood and cypress, Mr. Knowles stated that the use of this class of timber had retrograded considerably during the war, due to the difficulty of securing sufficient quantities of good grade material, but that this condition no longer prevailed. It was not necessary to paint such woods, in his opinion, except for looks, and he was inclined to believe that there was much in the idea that unpainted cypress actually lasted longer because of the better penetration of the moisture. He stated that good heart cypress had an almost indefinite life, but that there was some doubt as to whether redwood would last so well when used in territory where the climate differed greatly from that where it was grown.

CLOSING BUSINESS

AT THE closing session on Thursday morning the following officers were elected for the ensuing year: President, C. R. Knowles, superintendent of water service, Illinois Central, Chicago; first vice-president, A. Ridgway, assistant engineer, Denver & Rio Grande Western, Denver, Colo.; second vice-president, J. S. Robinson, division engineer, Chicago & North Western, Chicago; third vice-president, J. P. Wood, supervisor bridges and buildings, Pere Marquette, Saginaw, Mich.; fourth vice-president, C. W. Wright, master carpenter, Long Island, Jamaica, N. Y., and secretary-treasurer, C. A. Lichty, general inspector, Chicago & North Western, Chicago. The following directors were elected for two years; F. C. Baluss, engineer of bridges, Duluth, Missabe & Northern, Duluth, Minn.; Maro Johnson, assistant engineer, Illinois Central, Chicago, and O. F. Dalstrom, bridge engineer, Chicago & North Western, Chicago. Cincinnati was selected for the next convention.

The following resolution was presented and adopted unanimously:

Resolved, That the American Railway Bridge and Building Association in convention assembled deplores the present agitation for a strike of railroad workers and the individual members hereof reaffirm an unbroken rec-

ord of loyalty to their respective railroads and pledge anew their support to the managements in their efforts to provide uninterrupted, efficient and economical transportation for the American public.

The following subjects were selected for consideration by committees during the ensuing year:

1. Pile Driving Records.
2. Labor-saving Devices in Routine Bridge and Building Work.
3. Building Inspection and Records.
4. The Relative Merits of Wood, Steel and Concrete Tanks.
5. The Painting of Structural Steel.
6. The Framing of Bridge Timbers Before Treatment.
7. The Handling and Driving of Concrete Piles.
8. Sewers and Drains.

The annual dinner of the Bridge and Building Association and the Bridge and Building Supply Men's Association was held at Coney Island on Wednesday evening with approximately 400 present. Following the adjournment of the convention on Thursday afternoon the members made an inspection of the Pennsylvania Terminal, Sunnyside Yard, the New York Connecting Railway, the Hellgate Bridge and the electrified line of the New York, New Haven & Hartford between Stamford, Conn., and the Grand Central Terminal, traveling by special train and stopping en route at numerous points of interest to the members of this association.

THE SUPPLY EXHIBIT

THE BRIDGE and Building Supply Men's Association presented an exhibit of bridge, building and water service materials in a room adjoining the convention hall. Thirty-eight firms were represented with exhibits consisting of photographs, literature and models of their products.

The officers of the Supply Men's Association last year were: President, C. E. Ward, U. S. Wind Engine & Pump Company, Batavia, Ill.; vice-president, M. J. Trees, Chicago Bridge & Iron Works, Chicago; secretary, A. J. Filkins, Paul Dickinson Company, Chicago; treasurer, G. R. McVay, the Barrett Company, Chicago; honorary director, Tom Lehon, the Lehon Company, Chicago; members of the executive committee: W. O. Washburn, American Hoist & Derrick Company, St. Paul, Minn.; C. W. Kelly, Kelly-Derby Company, Chicago; D. J. Higgins, American Valve & Meter Company, Chicago; F. M. Condit, Fairbanks, Morse & Company, Chicago; T. W. Snow, the T. W. Snow Construction Company, Chicago, and W. H. Lawrence, Johns-Manville, Inc., New York City.

The companies exhibiting, with the nature of their displays and the names of their representatives, were as follows:

American Tar Products Company, Chicago; S. H. Fields and P. L. Griffiths.

American Valve & Meter Co., Cincinnati, Ohio; model of drop spout; J. T. McGarry and D. J. Higgins.

American Hoist & Derrick Company, St. Paul, Minn.; literature; F. J. Johnson and H. W. Davis.

American Radiator Company, Chicago; literature; G. J. Meyer.

Barrett Company, New York; samples of paint, roofing, shingles and literature; G. R. McVay, W. S. Babcock, G. H. Hilderbrandt and W. S. Wallace.

Carter Bloxonend Flooring Company, Chicago; photographs and samples of flooring; R. G. Stowell.

Chicago Bridge & Iron Works, Chicago; photographs and literature; Merle J. Trees, H. C. Brown and Sedrick B. Smith.

Cleveland Pneumatic Tool Company, Cleveland, Ohio; H. S. Covey and Guy Gregory.

Detroit Steel Products Company, Detroit, Mich.; window sash and literature; R. S. Bishop and W. H. Maxwell.

Detroit Graphite Company, Detroit Mich.; samples of paint and literature; L. D. Mitchell and J. R. C. Hintz.

Duff Manufacturing Company, Pittsburgh, Pa.; jacks; C. A. Methfessel.

Fairbanks, Morse & Company, Chicago; literature; A. A. Taylor, F. M. Condit, B. S. Spaulding, J. L. Jones, H. E. Vogel and E. J. Coverdale.

Ferrolineum Manufacturing Company, Jersey City, N. J.; samples of paint pigments; O. C. Wakefield.

Hastings Pavement Company, New York; literature and samples of block flooring and pavement; J. B. Weed and P. L. Thompson.

Highgrade Manufacturing Company, Cleveland, Ohio; literature and samples of roofing cement; S. A. Baber and A. C. Copper.

Johns-Manville Company, Inc., New York; samples of roofing, pipe and boiler installations, packing, flooring and shingles; J. E. Mink, E. L. Colopy, B. J. Jordan, G. A. Nichols and W. H. Lawrence.

Joseph Dixon Crucible Company, Jersey City, N. J.; literature; H. A. Neally and W. W. Chase.

Kelly-Derby Company, Chicago.

Lehon Company, The, Chicago; samples of roofing and shingles; Tom Lehon and John E. Eipper.

Luitweiler Pumping Engine Company, Rochester, N. Y.; model of deep-well water pump; E. E. Alexander.

Minwax Company, The, New York; model of bridge deck drain and literature; A. S. Harrison, R. W. Harrison and J. E. Marble.

Massey Concrete Products Corporation, Chicago.

National Lead Company, New York; literature; G. M. Hartley, Jr., and A. H. Sabin.

Norton, A. O., Inc., Boston, Mass.; jacks and jack cover; G. R. Law and Wm. R. Kelly.

Nelson, Jos. E., & Sons, Chicago; literature; J. E. Nelson and W. K. Nelson.

Nichols, Geo. P., & Bro., Chicago; literature.

Pocket List of Railroad Officials, New York; copies of paper; K. A. Brown and J. A. Brown.

Patterson, W. W., & Co., Pittsburgh, Pa.; tackle blocks; W. W. Patterson, Jr.

Patterson & Sargent Company, Cleveland, Ohio.

Paul Dickinson, Inc., Chicago; model of cast-iron camp car jack and ventilators; A. J. Filkins.

Railway Review, Chicago; copies of paper; W. M. Camp, G. L. Bates and J. E. Gougeon.

Robertson Company, H. H., Pittsburgh, Pa.; literature and samples of asbestos protected metal, skylights, ventilators and roofing; Willis S. Hackedorn.

Robertson & Company, Wm., Chicago; model of culvert; R. F. Repasz and T. F. Landergan.

Simmons-Boardman Publishing Company, New York; copies of papers and cyclopedias; E. T. Howson, W. S. Lacher, Milburn Moore, F. C. Koch, B. J. Wilson and H. L. D. Jackson.

Sherwin-Williams Company, Cleveland, Ohio; F. A. Elmquist and John Schlintz.

Snow Construction Company, T. W., Chicago; literature; T. W. Snow and B. S. Snow.

U. S. Wind Engine & Pump Company, Batavia, Ill.; literature; C. E. Ward.

Volkhardt Company, Inc., The, New York; model of hydrants and torches; Wm. Volkhardt.

At the annual election on Thursday the following officers were selected for the ensuing year: President, M. J. Trees, Chicago Bridge & Iron Works, Chicago; vice-president, G. R. McVay, the Barrett Company, Chicago; treasurer, A. J. Filkins, Paul Dickinson Company, Chicago; secretary, D. J. Higgins, American Valve & Meter Company, Chicago; honorary director, C. E. Ward, U. S. Wind Engine & Pump Company. Members of the executive committee: Wm. Volkhart, Wm. Volkhart, Inc., New York City; F. M. Condit, Fairbanks, Morse & Co., Chicago; W. H. Lawrence, Johns-Manville, Inc., New York City; T. W. Snow, T. W. Snow Construction Company, Chicago; J. E. Nelson, Joseph E. Nelson & Sons, Chicago, and B. J. Wilson, *Railway Maintenance Engineer*, Chicago.

EMPLOYEES BUY STOCK.—The New York Central has adopted a plan whereby the company will buy shares of its capital stock on the open market for employees, the shares to be paid for in monthly installments, according to a plan whereby each installment, if the employee so desires, will be deducted from his pay for the first half of each month until the stock is paid for in full.

RECORD TIMBER PRESERVATION IN 1920

THE STATISTICS on wood preservation for 1920, prepared by the American Wood Preservers' Association in co-operation with the Forestry department of the U. S. Department of Agriculture and published in the annual proceedings of the former organization, show that, by large increases made in the last two years, the slump in wood preservation during the war period has not only been overcome, but that the record of 1914 has been exceeded by a large margin. As shown by the report a total of 173,309,505 cu. ft. of wood was treated in 1920, this figure being larger than that reported for 1919

Wood Preservation 1909-1920, Together With Consumption of Creosote and Zinc Chloride.

Year	Total Material Treated Cubic Feet	Number of Cross Ties Treated	Creosote Used Gallons	Zinc Chloride Used Pounds
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,888	40,260,416	108,378,359	26,466,803
1914	159,582,639	43,846,987	79,334,606	27,212,259
1915	140,858,963	37,085,585	80,859,442	33,269,604
1916	150,522,982	37,469,368	90,404,749	26,746,577
1917	137,338,586	33,459,470	75,541,737	26,444,689
1918	122,612,890	30,609,209	52,776,386	31,101,111
1919	146,060,994	37,567,927	65,556,247	43,483,134
1920	173,309,505	44,987,532	68,757,508	49,717,929

by 27,248,511, or 18 per cent, and larger than the record made in 1914 by 13,714,866, or more than 8 per cent.

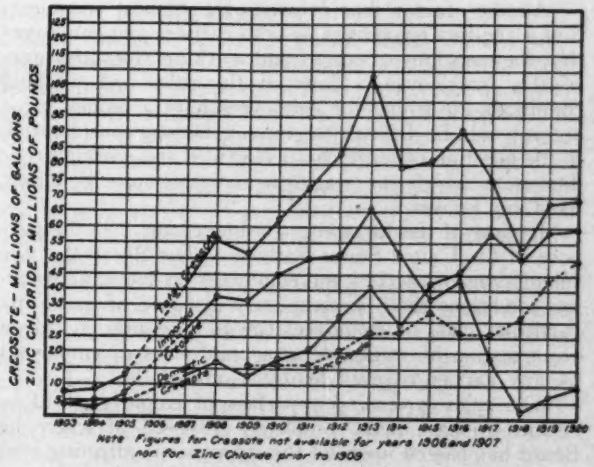
Consistent with previous years, cross ties again constituted the bulk of all wood treated, the number reported for 1920 being 44,987,532, a figure which is larger than that of 1919 by 7,419,605, and of the banner year by 2,127,298. They represent 80 per cent of all the wood treated in 1920. The remaining 20 per cent includes 11,965,912 lin. ft. of piling, which is a decrease of 1,591,607 ft. from the quantity in 1919 (the record year for piling); 585,781 poles, which is an increase of 207,300 over the number for 1919 and constitutes the record production of poles; 2,568,156 sq. yd. of wood block, which is an increase of 772,469 yd. over 1919, but less by nearly 30 per cent than the production of the banner year of 1916, and 139,749,732 bd. ft. of construction timber, which is a decrease of more than 3 per cent from the record production in 1919.

The number of treating plants engaged in timber preservation in 1920 was 112 out of the total number of serviceable plants of 122. In 1919 the number of plants operating was 108. Of the 122 plants available for treating, the report shows that 96 are of the pressure type, 20 of the non-pressure type and 6 of both pressure and non-pressure type; also that of the 122 serviceable plants 28 are railway owned, 78 commercially owned and 16 privately owned. The report shows, further, that of the 28 plants which are railway owned 27 were in active operation in 1920.

Referring to the amount of preservatives used, the report shows that 68,757,508 gal. of creosote was used in 1920 in addition to 1,084,911 gal. of paving oil, 1,772,084 gal. of miscellaneous preservatives and 49,717,924 lb. of zinc chloride. The quantity of creosote used, which includes distillate, coal tar creosote, creosote coal tar solution, refined water gas tar and water gas tar solution, represents an increase of 3,201,261 gal. over the reported consumption in 1919, but is still 39,615,811 gal., or nearly 40 per cent less than the record consumption in 1913. On the other hand, the consumption of zinc chloride in 1920 not only shows a substantial increase over 1919, but constitutes the largest consumption on record.

The more rapid increase in the consumption of zinc chloride over creosote is largely explained by the fact that more than twice the amount of ties treated in 1920 received the zinc chloride treatment as against the creosote treatment, the figures being 29,132,720 and 13,371,517, respectively. One interesting observation to be made in connection with creosote is that while 73 per cent of all creosote used in 1909 was imported, the domestic production of this preservative has steadily increased from 13,863,171 gal. in 1909 to 59,181,828 gal. in 1920, the latter figure representing 86 per cent of the total consumption. In the same period the consumption of imported creosote decreased from 37,569,041 gal. in 1909 to a figure as low as 2,165,736 in 1918. With the return of ocean transportation to a point more nearly normal, however, the importation of creosote has shown substantial gain, 18,427,152 gal. having been imported in 1920, of which 9,575,680 was reported to have been consumed in timber preservation.

The report is particularly interesting with respect to cross tie preservation. As stated above, 44,987,532 ties, or nearly 80 per cent of all of the wood preserved, was treated in 1920. Of these ties 33,300,339 were hewed and 11,687,193 sawed; while 13,371,517 were treated with creosote, 29,132,720, or more than twice as many, with zinc chloride, and 2,471,622 with zinc creosote emulsion. Of all the ties treated 42,676,739, or 95 per cent, were used by steam roads, and of the latter ties 1,579,552 were reported as having been adzed, 295,577 bored, 8,249,591 both adzed and bored, and 32,552,019 neither adzed or bored. The kinds of ties in the order of their consumption, together with the number of each treated, are as follows: Yellow pine, 16,621,773, or 36.9 per cent of all the ties; Oak, 14,531,848, or 32.3 per cent; Douglas fir, 3,861,514, or 8.6 per cent; beech, 2,462,663, or 5.5 per cent; western pine, 1,794,307, or 4 per cent; maple, 1,340,755 or 3 per cent; gum, 949,079, or 2.1 per cent; birch, 921,260, or 2 per cent; hemlock, 700,238, or 1.6 per cent; tamarack, 549,727, or 1.2 per cent; elm, 506,419, or 1.1 per cent, and all other kinds 747,949, or 1.7 per cent.



Progress of Wood Preservation in U. S.

The 11,965,912 lin. ft. of piling treated with preservative in 1920 is shown by the report to consist principally of Southern pine and Douglas fir, practically all of which was treated with creosote. The latter is also the case with poles. With respect to construction timbers, however, which include all heavy structural material such as bridge and dock timbers, switch ties, etc., and of which nearly 149,000,000 ft. b. m. were treated in 1920, the report shows that nearly two per cent were zinc treated.

General Railroad Walkout Called Off

Leaders of Train Service Brotherhoods Cancel Strike Arraingements at the Eleventh Hour

AFTER almost endless negotiations the threatened general railroad strike was finally called off at 11:30 p. m. on Thursday, October 27, through the efforts of Ben W. Hooper, vice-chairman and public group member of the Railroad Labor Board. The railway managements cannot be said to have been a party to the negotiations since they have contended that the controversy leading to the strike declaration was a matter of dispute between the unions and the Labor Board, therefore, the settlement of the strike involves no concessions by the railways themselves. The agreement to cancel the strike order is apparently founded solely on the statement of Mr. Hooper that the Board will not consider plans for further reductions in the wages of any class of employees until after all matters concerning rules and working conditions of that class before the Board shall be completely disposed of. Abstracts from Mr. Hooper's statement are given below:

"It is not within the province of the Labor Board to shut the door in the face of either carrier or employee desiring to submit a dispute to the Board, or to dictate the time when such dispute shall be filed. It is, however, within the discretion of the Board to fix the order in which it will take up and consider the numerous matters submitted to it.

"It will thus become apparent that the employees, who are protesting against a further wage cut, are crossing bridges long before they can possibly get to them and that carriers cannot hasten a wage reduction by applying for it at this time.

"Another factor that demands the highest consideration is the fact recognized by both carriers and employees that the questions of wages and working rules are inextricably interwoven. Many of the rules and working conditions governing the employees have a money value and it would be defficult to give satisfactory consideration to the question of wages until the rules and working conditions to which the wages would apply are definitely fixed and known.

"It view of the foregoing considerations, it is the purpose of the United States Railway Labor Board that the submissions of carriers and employees on rules and working conditions shall be completely disposed of as to any particular class of employees before a hearing is had on any question of wages affecting said class of employees on any carrier covered by Decision No. 147.

"The rules governing any class of employees will be deemed to have been completely disposed of when the Board has passed upon all the submissions affecting said class, either by decision of disputed rules or by referring them back to a conference of the carrier and employees."

While the controversy which led to the strike vote cannot be said to have been settled conclusively, the present crisis is definitely disposed of. The strike agitation dated back to July 1, when all of the unions of railway employees took referendum votes on the acceptance of the wage reduction, as provided for in the Board's Order No. 147, issued on June 1 and effective July 1, the ballots in general providing for the authorization of a strike in case the required percentages of each union favored a rejection of the wage cut. This voting consumed several weeks, but early in October the union leaders announced that the expression was overwhelmingly in favof of a strike, and following a series of conferences, a strike was announced on October 15 to become effective on the first roads on October 30. This announcement followed a visit of a delegation of the brotherhood leaders to a meeting of the Association of Railway Executives on October 14 for the purpose of repeating an earlier request on the railroads that they withdraw the wage reductions which became effective July 1. A refusal to accede to this request was followed by the strike announcement, which outlined plans for a progressive development of the walkout, beginning with one group of roads on October 30, another on November 1, a third on November 3, and a fourth group on November 5. This general walkout was antedated by a strike of the train service employees on the International & Great Northern on October 23. This local strike was already in effect when the general strike was called off.

Various attempts were made to avert the threatened strike. At the hearing called by the Labor Board on October 26, at which the leaders of the five train service brotherhoods were questioned as to the motives of the strike and which was largely attended by the railway executives, the union leaders declared that the strike could be averted only by a total surrender to their demands, which included a recall of the Board's wage reduction order No. 147, a complete cessation of efforts to eliminate time and one-half for overtime and the entire abandonment of any plans for further wage cuts, such as were proposed by the Association of Railway Executives as a part of a project for lower freight rates.

Maintenance of Way Employees Drop Out Entirely

Although the first news bulletins gave every indication that there would be a general strike of all the organized railway employees, later developments indicated a defection in the ranks characterized by announcement from various union leaders denying that their organizations would participate in the strike plan of the five train service brotherhoods. This apparently arose from a lack of complete sympathy or co-ordinated effort between the five train service brotherhoods on the one hand and those employee organizations who are either affiliated or associated with the American Federation of Labor on the other hand. This became apparent when the shop crafts and the maintenance of way employees withdrew their direct support of the strike.

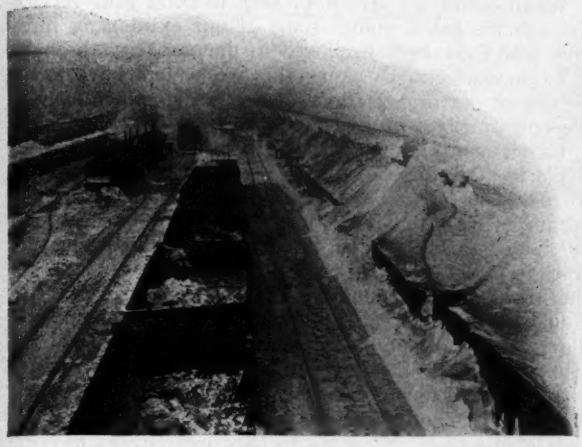
In the earlier statements of E. F. Grable and J. C. Smock, president and vice-president, respectively, of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, and of B. M. Jewell, president of the Railway Employees Department of the American Federation of Labor, there was every indication of a whole-hearted determination to carry out the strike, but the officers of these and all the other organizations except the five train service brotherhoods and the telegraphers' subsequently gave out statements announcing that they would not go on strike.

The labor crisis was complicated on October 13 when the Labor Board handed down a decision with respect to 17 rules relating to the agreements between the roads and the shop employees. Of these, Rule 1 was modified so as to remove the ban on piece work. The other changes will also be effective in eliminating many of the arrangements which have been instrumental or largely responsible in producing inefficient and uneconomical methods.

HANDLING SNOW AND ICE IN TERMINALS*

A Discussion of the Practical Problems of Organization, Methods and Equipment

BY J. J. NAVIN,
Supervisor, Pennsylvania System, Chicago



LARGE TERMINALS where ground is expensive, necessitating the most intensive development, with their large interlocking plants, platforms at stations and coach yards, and closely knitted engine house and yard ladder layouts, create many distinct problems for the maintenance man. One of those, I might say a major one, is the successful coping with winter conditions, chief of which is the handling of snow and ice. To meet these responsibilities successfully we must have (1) preparedness, (2) organization and (3) co-ordination between the various branches of the maintenance of way department and co-operation with all other departments of the railroad.

By preparedness I mean principally that work which should be performed in the fall of the year, such as the general cleaning up of all rubbish along tracks and in storage places adjacent to tracks, the general overhauling and cleaning of the sewer system, the cleaning out under frogs, switches, guard rails, etc., seeing to it that all snow fighting equipment is in good condition and quickly available for use and that all designated places are equipped with sufficient brooms, snow shovels, salt and other necessary equipment to take care of the needs in so far as one can see them. There is also a mental preparedness in which the forces should participate in a general discussion of the subject of handling snow and ice before it arrives. It is also advisable to renew instructions to train men and others interested, impressing upon them the importance of exercising the utmost care when filling engine tanks at water stations to prevent water from spilling upon the track.

ORGANIZATION IS ESSENTIAL

Organization is necessary to the economical and efficient conduct of any work, but in no maintenance problem is proper organization more essential than in the fighting of snow and ice in large terminals. For unless we have an efficient handicap much money will be wasted and a severe handicap, if not actual delay, placed upon our transportation department. This organization comprises every member of the division engineer's force, divided into the several inter-department groups. The first line defenses comprise the track and interlocking forces who get on the job just as soon as it becomes advisable, in, or previous to, a snow storm. The second line consists of the carpenter department forces and those of any other department having skilled men available who can be depended upon as relief men to keep strategic points manned when a storm lasts for many hours or when one storm quickly follows another and exhausts the first line. The third line consists of the temporarily employed snow shovelers recruited to accelerate the cleaning-up program, these men being drawn upon to fill the gaps in the first two lines as may become necessary. The division engineer is the general directing head, assisted by his personal staff, the supervisor of tracks heading the organization on his subdivision. Assistance is rendered in any manner found necessary by the engineering corps. Strict watch is kept on the U. S. weather forecasts and they are read to all interested so that the proper alertness may be maintained in order to get the jump on conditions as they develop.

While ably assisted in snow fighting work by the interlocking and carpenter forces, the bulk of this work necessarily falls upon the track forces. Not the least factor in the successful prosecution of such work is the advantage gained by having a track personnel consisting of trained men who are thoroughly familiar with all local conditions and requirements, for one can get better results with one trained man in a complicated location than with five men unfamiliar with conditions and locations, for the simple reason that the trained man knows what to do, why he is doing it, and has sufficient knowledge of traffic conditions to be able to take care of and protect himself against personal injuries.

Many emergencies arise, even in times when regular force allowances are liberal, but yet inadequate to meet the conditions. In such cases we must necessarily resort to temporarily recruited men whom I have placed in the third line. We have a great deal of difficulty with this class of men, especially in congested territories, partly on account of their general indifference and their desire to give as little service as possible, but chiefly on account of their general inefficiency and bewildered mental state amid traffic surroundings.

As a road must necessarily employ such men at times, we attempt, in so far as is possible, to confine their service to the bulky portions of the work, such as snow loading, platform cleaning and general flanging, using our first and second line men in locations requiring skill. Our greatest handicap with the recruited men is in night work and if at all possible we get along without them in such service. In fact, we find it advisable to do only such night work as becomes necessary to keep our facilities in operation, and do all our bulky work in daylight hours when proper supervision can be given and greater results attained.

I want to emphasize the importance of keeping a sufficient number of trained men in winter service, if at all possible, to enable one to take care of all strategic locations during snow storms and thereby avoid the necessity of resorting to temporary men, not alone from the standpoint of efficiency, but also from that of personal safety, for it is almost impossible, in a raging blizzard or snow storm, to supply sufficient supervision and care over men to insure safety. In such conditions a man's safety depends largely upon his own alertness and general knowledge of the character of work in which he is engaged.

*A paper read before the Maintenance of Way Club of Chicago on the evening of October 26.

Terminal territory maintenance, unlike that of outlying or line divisions, is in no sense seasonal work, for there are a great many tasks other than that of fighting snow which can be programed for winter work and which, if held over until the summer months, will cut into a summer program and retard, to a considerable extent, particular work which must be done in the summer months, owing to climatic conditions. I am an ardent advocate of balanced forces, particularly in terminal territories, and can see no loss of economy in adhering to such a practice.

OPENING THE TRACKS

Getting down to the fighting of snow and ice we find this divided into three stages: (1) The storm period, during which time efforts are confined almost entirely to keeping the line open for the required traffic functions, (2) that of generally opening and clearing track facilities and disposing of the accumulation, not alone to supply the necessities of the particular time, but to prepare for additional snow fall, (3) the thawing period where we have to prepare for the inevitable freezing period. In this latter stage of the work a great deal depends upon the efficiency of the sewer system, for unless there is an efficient sewer or drainage system to carry away the water and it is allowed to freeze around the switches, etc., one can visualize the results.

The methods which we employ during storms, wherein we only attempt to keep our facilities open, consist chiefly of the use of the old reliable brooms and shovels, except at interlocking plants where we make extensive use of portable hand-operated oil-burning snow thawers. We also make quite extensive use of salt in switches and on station platforms. However, we discourage the use of salt around interlocking plants because of its deteriorating effect upon such equipment.

As soon after the storm as is consistent with conditions we give our track facilities a general opening, loading the snow which cannot be disposed of in other manner onto cars, with work train service. Where conditions permit and we find it more economical we use two men carrying boxes and in some cases wheelbarrows to convey the snow to unused property or cars set at convenient places on tracks. On account of the many congested locations we are compelled to load a great many cars of snow and these are given final disposition by sending them to outer dumps for releasing.

The average number of cars of snow loaded in the congested terminal territory on our railroad in Chicago reaches about 400, while the number of cars loaded with snow in this territory during the severe storm period of 1918 reached 2,400. Practically all of this was loaded by hand, although we did employ locomotive cranes for a small part of this work, particularly for handling the loosened ice.

We are often forced to recruit a large number of extra men, and on account of the industrial conditions of the last few years we have had to depend almost entirely upon the class known as "hobo" labor. It is generally necessary to supply this class of men with their meals while in service. We also find it advisable during some of our severe storm periods to supply meals to our regularly employed men out on the track while in snow fighting service.

In the employment and feeding of extra men a considerable amount of clerical work becomes necessary and for this work we bring in that part of the organization known as the engineering corps. These men take care of the timekeeping and checking and make such arrangements as become necessary at local restaurants and eating houses for the proper feeding requirements. By availing ourselves of this part of the organization it leaves us and our foremen free for the actual direction and supervision of the men.

When conditions permit we keep in extra gang service through the entire winter some of our extra gang foremen who have been employed in that capacity throughout the summer. By doing this we seldom have to go outside of our organization for qualified foremen to handle temporarily recruited men.

In heavy storms and drifting periods our tracks, particularly those in yards, become so clogged with snow as to make operation difficult. When this condition confronts us we often resort to the use of a spreader car, for with its use snow can be practically cleared from the tracks in a short time and at small expense, providing the transportation conditions will allow its use. Of course, little good can be accomplished in this manner along yard leads or places where switch stands and the like will greatly interfere with its operation, but in yard tracks and many locations on our main tracks the spreader car can be used very satisfactorily.

It is necessary, of course, to have clear tracks to operate on. A spreader car will clear a space from 17 to 22 ft. Our method is to start on the first track and keep spreading this snow from track to track until the accumulation becomes so large that it must be left upon the track, then we skip this track and spread again from track to track in the same manner until all our tracks, excepting the few on which this large accumulation is piled, are practically free of snow. This method of clearing a yard requires a great deal of shifting of cars and for this reason it is not always practical, but when it can be done it is a great money saver and a very quick method of giving the transportation department clear yard tracks. The accumulation of snow upon the several yard tracks may be left there and those tracks kept out of service, or if it is advisable to dispose of the snow, it can be loaded much more quickly and cheaply than if scattered all over the yard.

Aside from the difficulties of snow conditions we also have some very trying ice conditions around our engine house layouts during severe freezing periods. We have tried the extensive use of salamanders to alleviate such conditions, but have not been very successful in this respect, for even with their use we find ourselves called upon to do a great deal of ice picking at these locations. This, of course, also necessitates the disposal of this ice and for this loading we frequently make use of locomotive cranes.

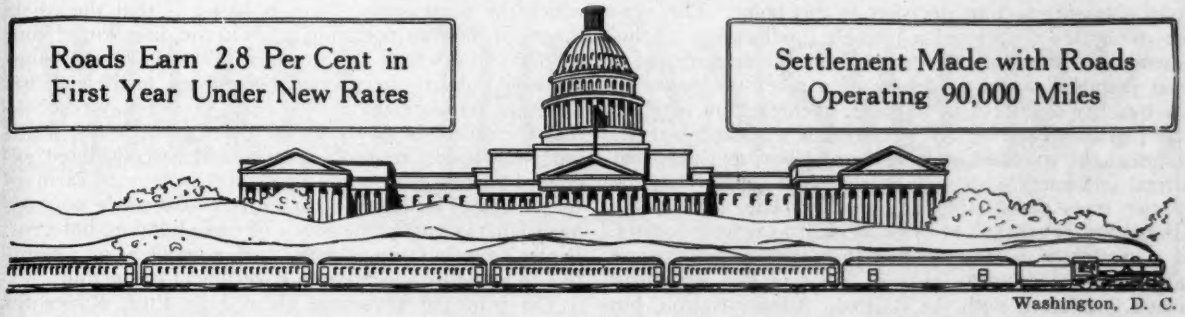
One of the greatest aids to maintenance men in fighting snow and ice, under the handicap of severe storms and raging blizzards, is the co-operation received from our transportation department. As all terminal men know, there are times during such storms when it is impossible, no matter how many men we have, to keep all facilities open and working, and when such conditions confront us, men assigned by the transportation department, such as assistant trainmasters and general yardmasters, render valuable assistance by cutting down and getting along with as limited facilities as possible until the storm subsides. This allows us to concentrate all our efforts on the most important traffic lanes and in this manner we are able to keep our railroad operating.

A study of the methods now in use shows that they are with slight exception practically the same as those of 20 years ago, with little improvement or progress. In view of the advancement made in other lines of maintenance work it seems to me that there is a wide field for inventive genius in the designing of snow fighting equipment to lessen the present extravagant outlay of labor required in the handling of snow and ice by hand in the terminals.

RAILWAY AFFAIRS AT THE NATION'S CAPITAL

Roads Earn 2.8 Per Cent in First Year Under New Rates

Settlement Made with Roads Operating 90,000 Miles



Washington, D. C.

STATISTICS of revenues and expenses for August, which have just become available, complete the first year of operation by the railways under the increased freight and passenger rates prescribed by the Interstate Commerce Commission, which went into effect on August 26, 1920. These show that for the 12 months' period under the rates designed to produce a 6 per cent return the Class I roads have earned a net railway operating income of $530,000,000, which is 2.8 per cent on the value. The railways, therefore, under the new rates, fell short by $586,000,000 of earning a 6 per cent return.

The small return earned by the roads in the first year under the new rates was in the face of almost the largest total operating revenues they have ever had, $6,044,000,000, as compared with $6,225,000,000 in the calendar year 1920. Their operating expenses, however, were $5,161,000,000, as compared with $5,826,000,000 in 1920 and their taxes were larger than in 1920.

For the month of August the roads earned $90,000,000, or at the rate of 5 per cent, but the fact that they did as well as that was largely due to the continued postponement of necessary maintenance work. The maintenance expenditures for August were approximately $151,000,000 less than they were for August, 1920. While the August, 1920, accounts included some $79,000,000 of back pay chargeable to earlier months, a large part of which was, of course, in the maintenance accounts, it is apparent that if the roads had expended as much for maintenance this August as they did last August, after making allowance for the back pay, the net operating income for the month would have been practically wiped out. For the first eight months of the calendar year 1921 the net operating income was $303,752,000, or at the annual rate of 2.5 per cent on the value. For August there were still 38 Class I roads that had deficits.

Freight Traffic Increasing

Railroad freight traffic has been showing a steady improvement since early summer, which means a corresponding increase in the general business of the country. The increase in the volume of traffic does not mean so much as the figures indicate on their face because there is always a seasonal increase from spring to fall, but the latest reports received indicate that the amount of freight moved by the railroads recently is showing a considerably smaller percentage of decrease as compared with the record-breaking traffic of last year than did the figures for the earlier months of the year and, as compared with anything but the war years, the present volume of traffic would be considered very good.

The Interstate Commerce Commission's monthly report of operating statistics of Class I roads for July and the first seven months of 1921 shows a reduction in the number of freight cars owned from 2,371,599 to 2,343,090. The average miles per car per day for seven months in 1921 was 21.5, as compared with 23.5 in 1920. The net ton miles per car day averaged 375 as compared with 473, and the tons per car 27.9 as compared with 28.6. The average train load was 643 as compared with 700, but the train speed in 1921 was 11.5 miles per car as compared with 10.4 in 1920. The traffic density, net ton miles per mile of road per day, for 1921 averaged 3,883 as compared with 5.072. The average locomotive miles per day was 48.6 as compared with 61.1. For the month of July the average train load was 660 tons as compared with 745 last year. The average train speed was 11.9 miles per car as compared with 10.5.

Railroad Administration Settlements with the Railroads

Announcement was made from the White House that the Railroad Administration had made final settlements of the accounts arising from the 26 months' period of federal control with railroads operating 90,000 miles, or approximately 37 per cent of the roads that were under federal control. By these settlements the railroads were paid $117,717,000 against claims which they had filed amounting to $387,000,000. In other words, the roads received about one-third of the amount of their claims. These claims are based largely on the balance unpaid of the rental guaranteed the roads for the use of their property during the period of federal control and there are also claims by many of the roads for undermaintenance of their properties, while the government has counter-claims against some of the roads for over-maintenance. There are other items involving the adjustment of materials and supplies taken over with the roads as compared with the quantities turned back to the company and items of interest on both sides of the account. The White House statement said that the settlements thus far made represented nearly 50 per cent of the claims filed by the railroads. Claims had been filed up to October 1 by railroads operating 189,000 miles for a total of $856,000,000. This represents 78 per cent of the mileage that was under federal control. On this basis it is estimated that the total claims of the roads would amount to $1,087,000,000. The Railroad Administration has recently been announcing settlements with individual roads at the rate of about a dozen a week.

Railroad Funding Bill

The Senate Committee on Interstate Commerce held a meeting on October 7 to discuss the railroad securities bill, but adjourned to hold another meeting later. The committee has already reported favorably the Townsend bill, which differs somewhat from the Winslow bill to the same purpose, which was passed in the House. The House bill as passed contained an amendment providing that no claims on account of the so-called inefficiency of labor during the period of federal control should be paid

from any of the funds provided for in the bill and this was worded in such a way that a railroad which failed to settle with the Railroad Administration might be barred from obtaining a court decision on this point. The Senate committee considered a possible modification of this amendment providing that except for the payment of a final judgment order or decree of a court no money in the treasury shall be used to make, in connection with the claim of any carrier, any payment or allowance on account of the so-called inefficiency of labor, and also that a final settlement with such carrier shall forever bar the carrier from prosecuting any further claim against the United States arising out of or incident to federal control. It is distinctly understood that the railroads will secure no allowance for inefficiency of labor in any settlement which is effected with the Railroad Administration, but it is believed that some roads will desire to make a further test of their claims on this account in the courts. The President has announced his intention of pressing the passage of the bill after the Senate has acted on the tax bill.

TRANSPORTATION TAXES TO BE REPEALED

The action of the Senate on October 4 in adopting an amendment to the pending tax bill providing for a repeal of the transportation taxes effective on January 1, which corresponds to a provision in the bill already passed by the House, practically assures the shippers and passengers of the country a reduction in the cost of transportation for next year af approximately $250,000,000. While the amount of the tax is comparatively small on freight transportation, 3 per cent, when compared with the increases in freight rates themselves that have resulted from the effects of the war, it is no inconsiderable item to a large shipper and adds to the grievance felt on account of the rate increases. The taxes on passenger and Pullman accommodation tickets, 8 and 10 per cent, not only represent an appreciable addition to the expense of travel, but as they are added separately to the rates received by the railroads they have constituted a source of much irritation. It is somewhat interesting to railroad men to observe that, although many high officials of the government and particularly members of Congress, have long been insisting upon reductions in railroad rates, the government itself has been somewhat slow in acting to sacrifice its revenue for the purpose of reducing transportation costs.

COMMISSION PRESENTS TENTATIVE CONSOLIDATION PLAN

A tentative plan for the consolidation of the railways of the United States into 19 systems with one alternative plan for the New England lines, was made public by the Interstate Commerce Commission on September 28, and served upon the railroads and state authorities as the basis for a plan to be adopted ultimately by the commission in accordance with the provisions of paragraphs 4 and 5 of Section 5 of the interstate commerce act, after public hearings. Under the commission's direction Prof. William Z. Ripley of Harvard University has prepared a report, which is printed as the appendix to the commission's report. In some respects the commission's tentative plan does not follow his recommendations, which proposed 21 systems, but presents alternatives for like consideration. The commission says it has sought to minimize dismemberment of existing lines or systems and that this tentative plan is put forward in order to elicit a full record upon which the plan to be ultimately adopted can rest, and without a prejudgment of any matters which may be presented upon that record. It, therefore, represents primarily only a beginning of what promises to be a protracted controversy over the question as to whether the railroads shall be consolidated. The issuance of the report does not mean the adoption of any policy of consolidation.

The underlying principle of Prof. Ripley's report, on which the commission's plan is based, is that the whole theory of the transportation act is in the direction of consolidation by which the stronger railroads of the country would absorb their weaker neighbors, to the end that a sort of standardization of earning power may result so that the railroads may prosper under group rates, which otherwise might result in what would be considered excessive earnings for some lines, but inadequate earnings for others The commission in its report made no comment whatsoever on the policy of consolidation, but Prof. Ripley's report strongly urges such a policy as an alternative to an added incentive to government ownership.

The principal advantage claimed by Prof. Ripley for a plan of consolidation is the opportunity to equalize the condition of the strong and weak roads, although he also points out some economies in operation which he believed would result. His plan in general does not contemplate the dismemberment of the existing larger systems, but in numerous cases what are now considered large roads are grouped to make a still larger system. He does not attempt to equalize mileage for his proposed systems range from 2,761 miles to approximately 20,000 miles. His effort is rather to preserve existing routes and channels of trade and commerce and to bring about an equalization of earning capacity in relation to investment.

CHARLES C. MCCHORD ELECTED CHAIRMAN OF I. C. C.

Commissioner Charles Caldwell McChord was unanimously elected chairman of the Interstate Commerce Commission on October 3, succeeding Edgar E. Clark, who recently resigned as a member of the commission to engage in private practice. The commission's announcement said the election was pursuant to the policy adopted January 13, 1911, for rotating the office of chairman annually in the order of seniority of the members of the commission. His term was made to run until December 31, 1922, to make the term of chairman coterminous with the calendar year. Commissioner McChord was appointed a member of the commission by President Taft in December, 1910. He served as chairman for the year beginning in March, 1915. Chairman Clark was elected in March, 1920, for the year ending June 30, 1921, but when that term expired he was re-elected, upon the motion of Commissioner McChord.

NUMBER OF RAILROAD STOCKHOLDERS

The wide distribution of ownership of railroad stock and a large increase in the number of railroad stockholders during the past three years is shown in a report just made public by the Interstate Commerce Commission, which indicates that when stock has been sold during that period it has been purchased by a larger number of persons holding a smaller average number of shares than that of the former owners. The total number of stockholders of the Class I railroads of the United States (those having annual earnings of $1,000,000 or over) at the end of 1920 was 709,795, according to a compilation made by the Bureau of Statistics of the Interstate Commerce Commission, published in a preliminary abstract of railroad statistics for the calendar year 1920. In a special report on the distribution of railroad security holdings issued in 1919 the commission reported the number of stockholders for the Class I roads *and their non-operating subsidiaries* as of December 31, 1917, as 627,930. The increase in the number of holdings in the Class I roads alone in three years was therefore more than 81,865, because the present report does not include the roads belonging to the subsidiary class of properties.

THIS department is a repository for inquiries and discussions relative to practical problems of common occurrence in maintenance of way suggested by our readers. Each month at least four of the inquiries are presented for discussion in order that there may be at least one inquiry pertaining each to track, bridge, building and water service. The discussions on these inquiries are then published two months later. All readers encountering problems in connection with which the opinion of railway men in other parts of the country might be desired or who have decided opinions upon those inquiries made which might be of value to other readers of the paper are requested to communicate with the editor in this respect. The following discussions are published with reference to the inquiries presented in the September issue or with reference to discussions appearing in previous issues of the *Maintenance Engineer*, as the case may be:

FIRE EXTINGUISHERS IN DEPOTS

How many and where should fire extinguishers be placed in small passenger stations?

We have no hard and fast rule as to how many extinguishers should be placed in any of our buildings. We do, however, maintain one extinguisher in each small station, and where there is a division wall to permit two waiting rooms, one extinguisher is placed in each room. If the agent occupies the second floor as living quarters, we generally have an extinguisher in the kitchen for protection.

L. F. SHEDD, General Supervisor Safety and Fire Prevention, C. R. I. & P.

CUTTING RAIL WITH A CHISEL

How close to the end should a rail be cut off with a chisel in preference to a hack saw and how can it be done most effectively?

From my experience, I find that one should not attempt to cut a rail closer than five inches to the end. If it is desired to make the cut closer, a hack saw should even be used as well as when the cut comes over a bolt hole, as it is difficult to make a straight cut with a chisel over or through bolt holes. In cutting rail that close to the end, the rail should be cut with the chisel on the base, top and bottom. The girder section should also be cut on both sides, including the under side of the head, but not the top or sides of the head. The rail should then be turned over on its head, a short piece of rail placed under the cut, and a sharp chisel held in the cut on the center of the base. Striking the chisel a sharp blow with a sledge a couple of times will usually open up the cut, the piece falling off.

Cuts can be made this way at a cost of 20 cents, as against 80 cents for hack saw operation. It is, however, important that the cut should be straight for same distance from the end on both sides of rail, for if the cut is off line the rail is difficult to break.

WM. HOGAN, Supervisor Baltimore & Ohio, Chicago Terminal, Chicago.

SECOND ANSWER

A rail should not be cut, in my judgment, closer than fourteen to sixteen inches from end with chisel. Where shorter lengths than that must be cut off, it should be done with a hack saw. When cut with a chisel it is necessary to cut so deep as to flaw the rail all around from the imprint of the chisel, making it necessary to dress end of rail with sharp file in order to make fastenings properly fit up.

As another point, the piece cut off should not be shorter than what a section foreman could break with a Jim Crow, which requires from fourteen to sixteen inches. A rail can be cut successfully with a chisel that length and broken nicely with the use of a Jim Crow.

T. THOMPSON, Roadmaster, A. T. & S. F.

TUNNELING IN CULVERT CONSTRUCTION

When replacing or repairing a defective culvert, at what depth of embankment over the top of the culvert does it become more economical to tunnel.

FIRST ANSWER

The character of material encountered and the size of culvert in question are the main factors in determining whether or not it is more economical to work in open cut

What Would Be Your Answer?

The following questions will be answered in the January issue:

(1) What is the most practical method of driving back the rails to close up wide expansion openings?

(2) Inasmuch as present practice requires pre-heating of all concrete materials in cold weather and the heating of masonry stone is usually impracticable, how should the laying of stone masonry be handled in cold weather?

(3) How should whitewash be made in order to give the most effective service?

(4) Is a check valve's location and position with respect to a displacement pump of any consequence from a standpoint of the efficiency of the pumping system? If so, what is the general rule for installing such valves?

or tunnel when replacing or repairing a defective culvert. In my opinion, I would say when a fill is 20 ft. or more from the base of rail to the top of the culvert it will be more economical to tunnel, under ordinary conditions, while any depth less than 20 ft. can be handled better in open cut. An answer, in a general manner, to this question cannot be given to cover all conditions. Each case should be studied separately, considering traffic and circumstances at the culvert in question, and an estimate of cost made to determine the proper course to pursue.

J. P. ANDERSON, Assistant Engineer, N. C. & St. L.

SECOND ANSWER

The answer to this question involves so many conditions that I doubt whether any hard and fast rule can be laid down. The size of the pipe to be installed, the character of the materials in the embankment, the density of traffic, the weight of the locomotives, and whether the lower part of the trench is wet or dry are prominent factors which require consideration. As a large pipe requires a wider trench or tunnel than a small pipe, it involves the greater danger of the top of the tunnel caving in than in the case of a smaller pipe. The width of tunnel is not, however, in proportion to the size of the pipe. Even with a small pipe the tunnel must be large enough to permit the men to work in it. There is also more danger of the top of the tunnel caving in from the vibrations due to traffic in large tunnel if it is too close to the roadbed. Sand and gravel do not lend themselves to tunneling without the use of timbers to support the roof and sides of the tunnel. Also, if the culvert is being installed where the lower part is in the water, it increases the difficulty of tunneling unless the conditions are such as to permit the water to be pumped out readily.

Under conditions where the materials are sand or gravel it is doubtful whether tunneling would be advisable for the installation of pipe up to 30 in. dia. and where there would be 4 ft. of earth above the pipe. This would make the trench 6 ft. to 6½ ft. deep. Under light traffic there would be no question about the advantage of the open cut for this size of pipe and depth of cut. If traffic is too dense to permit the final move being made between trains, then stringers for supporting the track and sheet-piling for supporting the sides of the trench must be resorted to. If the soil is clay and the pipe small, say 18 or 20-in., tunneling would probably be advantageous.

With clay materials in the embankment and a depth of 5 ft. to 6 ft. or more above the pipe, in sizes from 36 in. to 60 in. there should be no question about the advantage of tunneling. In most cases tunneling at these depths is advantageous in sand and gravel, even when timbering is necessary. With pipe of 48-in. and 60-in. dia. the danger of caving is far greater in sand and gravel and there may be some question of the advantage of tunneling with less than 5 ft. of earth above the pipe.

In extreme cases it is of course necessary to resort to falsework and make an open trench. This is especially true where water is encountered and the soil is sand or gravel.

F. E. KING, Division Engineer, C. M. & St. P.

THIRD ANSWER

This is a matter which does not admit of any definite ruling unless there is knowledge of a number of controlling features. Deciding factors, in addition to the depth of fill itself, are the size of culvert, character of material encountered and density of traffic.

It should be borne in mind that the excavation for tunneling operation will probably cost three to four times as much as the open cut method, while the cost of heavy timbering and lagging required in tunnel, especially if traffic is fairly heavy, will more than offset the cost of piling and track stringers, of which the latter can usually be recovered. Also for small culverts or pipes, and fills of not more than 15 or 20 ft. in height, piling can be eliminated and the track merely supported on long stringers on blocking. The latter form of construction is desirable in any case even if tunneling is resorted to as a protection for traffic, and if the culvert is of any considerable size, say 8 ft. or more, it may also be necessary to support tracks on piling regardless of method of work adopted. This precaution will usually be required where the material in fill is of such a nature that slipping or movement may be expected where it is disturbed.

In view of the foregoing, it might be stated that the tunneling method is desirable only for comparatively small culverts, under high fills and with comparatively light traffic conditions. The limitation under these circumstances might be approximately stated as not less than a 30-ft. fill and not more than a 4 or 5-ft. culvert for such height. With an increasing height of fill an increase in size of culvert could also be fixed.

J. T. ANDERSON, Assistant Engineer, Baltimore & Ohio.

INSTALLING SEWER LINES UNDER PRESSURE

Under what circumstances, if any, is it good practice to install a sludge discharge line from a water softener so that it must flow under pressure?

FIRST ANSWER

For the moment I cannot think of any circumstances other than when the water supply is in a hollow and there is no creek or lower ground into which the sludge can be discharged without raising the discharge pipe at some point above its height at the point where it leaves the settling tank. In such a case it would be a question whether it is permissible to avoid a very deep and long trench by carrying the sludge pipe over a hill the top of which is lower than the top of the settling tank.

I believe it would be bad practice. Sludge flows very freely in suspension in water when fresh, but if allowed to settle in a pocket in a pipe it slowly agglutinates and is difficult to move. Magnesia water supplies a very sticky precipitate—much more so than that from a calcium water. In the case under discussion, I would either install a filter press and pump, keeping the sludge in cakes and returning the clear water to the settling tank, or, if I did lay the discharge pipe over the hill, I would have a large pit at the low spot in the pipe, into which the contents of the discharge line could be drained after each sludging. Ordinary sludge is a fair fertilizer and in some parts of the country the filter press plan might be made to pay. But a water softening plant ought not to be built in a low spot, unless on a creek or unless as a last resort.

C. H. KOYL, Engineer Water Service, C. M. & St. P.

SECOND ANSWER

Under most circumstances, especially at continuous plants, I consider it good practice to install a sludge discharge line from a water softener so that it must flow under pressure if the installation is well designed and proper precautions are taken with check valve vents to prevent water hammer where a quick-closing valve is used. Unless a sludge line has sufficient fall so that a self-cleaning velocity will be secured, there will be a more or less gradual stoppage of the pipe line and eventual clogging. With the line under pressure, sufficient clear water can be used to clean the line and obviate this trouble with incident saving in maintenance

expense. However, as in all water softening installations, the local condition must govern.

R. C. BARDWELL, Engineer Water Service, M. P.

PROPER POSITION OF HUMPED TIES IN TRACK

An answer to the August question: "Is it proper to place the humped side of a crooked tie upward in the track, and what makes this desirable or otherwise?"

If the question had been whether or not it is always proper to place the humped side upwards it would have been an easier one to answer. The writer believes that it is generally preferable to do so, because obviously there is less likelihood of the tie developing a center-bound condition, which would cause it to rock under train.

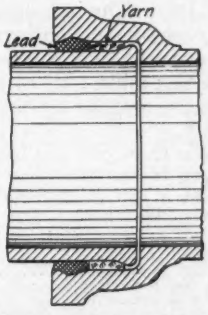
However, the degree of crookedness of the tie would in the main determine the question. If this were so pronounced as to foul with the blade of the snow flanger or the spreader car, the tie would better be reversed, even though considerable digging out of the old bed might be required. With proper care in the tamping the tendency of the tie to rock might be forestalled.

SUPERVISOR.

LAYING CAST IRON PIPE

A FURTHER ANSWER TO A JUNE QUESTION

I have noted the comments on laying cast iron pipe in the September issue of the *Railway Maintenance Engineer* and must admit that the author puts forth a very logical theory in connection with his views on the subject, yet I do not think his reasoning is correct as applied to the position of the bell in laying cast iron pipe. I note that the joints in a pipe line are compared to a series of funnels into which water is poured. I do not think this comparison applies, as there is no difference in the size of the pipe where the joints occur and the water passes from one pipe to another through the same size orifice. As will be noted by the sketch submitted herewith, the ends of the pipe are butted together and the pressure can only enter the joint at right angle to the flow. Therefore,

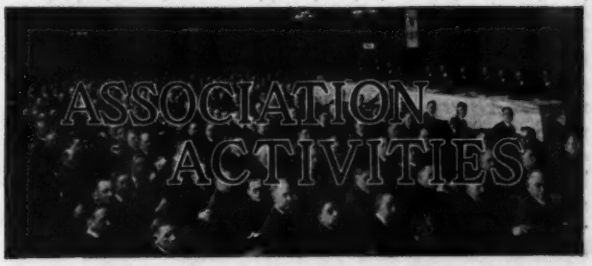


A Bell and Spigot Joint

it would make no difference in the effect on the joint if the flow was in either direction.

The illustration of the glass tube immersed in a stream of flowing water does not seem to apply in the case under discussion, as I assume that in carrying out the experiment the ends of the tube are left open and the difference in the height of water in the tube is due partly to the momentum of the water in the stream, and partly to capillary attraction. It is true that a certain amount of energy is represented by a certain flow, but the effect of this energy is felt only when we stop the flow and Pascal's law would apply so far as pressure is concerned, whether the body were at rest or in motion.

C. R. KNOWLES, Superintendent Water Service, I. C.



AMERICAN RAILWAY ENGINEERING ASSOCIATION

A bulletin of 90 pages containing a history of the development of the use of concrete, prepared by A. C. Irwin, engineer, Portland Cement Association, Chicago, is now going into the mail. This bulletin is profusely illustrated with photographs and drawings.

One hour will be set aside during the annual convention next March for a meeting in memory of John F. Wallace, first president of the association, who died on July 3, 1921. Opportunity will be presented at that time for his early associates and friends to pay tribute to this man, who contributed so largely to laying the foundation on which this association has since been built. A committee has been appointed to draft a suitable memoir, which will be presented at that time.

ROADMASTERS' ASSOCIATION

The members of the executive committee met at Chicago on October 26 to outline plans for the ensuing year. Consideration was given to the hotel facilities at Cleveland, which city was selected by the convention as the location of the next meeting. It was decided to hold the annual convention on September 19-21, 1922, one week later than that fixed by the constitution.

In addition to the subjects selected at the annual convention it was decided to appoint committees to report on The Conservation of Labor by the Use of Labor Saving Devices in Securing and Applying Ballast and to review present practices as to the non-spacing of ties. It was decided to limit the committees to five members in addition to the chairmen. The chairmen and three additional members of each of the committees were selected tentatively by the executive committee, leaving the two remaining members of the committees to be chosen by the chairmen.

TIE PRODUCERS' ASSOCIATION

The National Association of Railroad Tie Producers will hold its fourth annual meeting at the Hotel Sherman, Chicago, on January 26 and 27. This meeting will follow immediately after that of the American Wood Preservers' Association, which will be held at the same hotel on January 24, 25 and 26.

MAINTENANCE OF WAY CLUB OF CHICAGO

Approximately 75 roadmasters and others interested in the maintenance of tracks and structures gathered at the Auditorium hotel on Wednesday evening, October 26, for the second meeting of the Maintenance of Way Club of Chicago. The charter list for this organization was closed with nearly 100 charter members. J. J. Navin, supervisor, Pennsylvania, South Chicago, presented a paper on "Fighting Snow and Ice in the Terminals," which precipitated active discussion.

INTERNATIONAL TRACK SUPERVISORS' CLUB

The regular bi-monthly meeting was held in Buffalo, N. Y., on Saturday, October 22, with W. F. Nicholls (L. V.), vice-president, presiding. Consideration was given to the reports presented at the recent convention of the

Roadmasters' Association in Chicago, and particularly to that on the construction and maintenance of railroad crossings. After extended discussion it was the consensus of opinion of those present, some of whom have as many as 80 crossings on their sub-divisions, that a two-piece crossing is most satisfactory for short crossings of either carbon rail or manganese construction, the joints being placed in the line of lightest traffic. A concrete slab of sufficient thickness to prevent it from breaking was recommended for a foundation with not more than eight inches of ballast below the bottom of the ties, a greater depth of ballast being considered to accumulate dirt and moisture and to pump under traffic.

Plans were made to take up at future meetings of the club the subjects which will be considered by the Roadmasters' Association next year, particularly the maintenance and operation of motor cars and the relative merits of small section gangs supplemented by extra gangs for heavy repair work. It was also proposed to hold the next meeting in Pittsburgh, where opportunity will be afforded those attending to visit some of the large plants manufacturing track tools.

National Railway Appliances Association

The National Railway Appliances Association will hold a meeting in the office of the secretary, C. W. Kelly, Peoples Gas building, Chicago, on November 8, 1921. The object of this meeting will be to award exhibit space for the eleventh annual exhibit which will be held in the Coliseum, Chicago, on March 13-16, 1921, simultaneous with the convention of the American Association.

Maintenance of Way Conventions

American Railway Bridge and Building Association, C. A. Lichty, secretary, C. & N. W., Chicago. Next annual convention, Cincinnati, October 17-19, 1922. Simultaneous exhibit by Bridge and Building Supply Men's Association, D. J. Higgins, secretary, American Valve and Meter Company, Chicago.

American Railway Engineering Association, E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next annual convention, Congress Hotel, Chicago, March 21-23, 1922. Simultaneous exhibit by the National Railway Appliances Association at the Coliseum, C. W. Kelly, secretary, Kelly-Derby Company, Chicago.

American Wood Preservers' Association, G. W. Hunt, secretary, Box 375, Madison, Wis. Next annual convention, Hotel Sherman, Chicago, January 24-26, 1922.

International Track Supervisors' Club, A. M. Clough, secretary, supervisor New York Central, Batavia, N. Y. Periodic meetings at Buffalo, N. Y.

Maintenance of Way Club of Chicago, W. S. Lacher, secretary *Railway Maintenance Engineer*, Chicago. Evening meetings at the Auditorium Hotel on December 14, 1921, February 15, 1922, April 19, June 21 and August 16.

Maintenance of Way Master Painters' Association of the United States and Canada, E. E. Martin, secretary, Room 19, Union Pacific Building, Kansas City, Mo. Next annual convention, Buffalo, N. Y., October 3-5, 1922.

Metropolitan Track Supervisors' Club, S. A. Hart, secretary-treasurer, supervisor Pennsylvania Railroad, Mount Holly, N. J. Periodic meetings in New York City.

National Association of Railway Tie Producers, Warren C. Nixon, Western Tie & Timber Company, 905 Syndicate Trust building, St. Louis, Mo. Next annual meeting at Chicago, Hotel Sherman, on January 26-27, 1922.

Roadmasters' and Maintenance of Way Association of America, P. J. McAndrews, secretary, C. & N. W., Sterling, Ill. Next annual convention, Cleveland, Ohio, September 19-21, 1922. Simultaneous exhibit by the Track Supply Association, W. C. Kidd, secretary, Ramapo Iron Works, Hillburn, N. Y.

Freight Car Loading—Reports received by the Car Service Division of the American Railway Association show that 906,034 cars were loaded wth revenue freight during the week ended on October 15. This is an increase of 10,294 cars over the preceding week and represents the largest loading in any week since Nov. 13, 1920.

THE MATERIAL MARKET

THE MATERIAL market again displays sharp contrasts. Iron and steel prices are still on the decline, while lumber quotations display a marked increase. By far the most important piece of news in the iron and steel market for the railroads during the past month is the recently announced cut of $7 per ton in the price of rails, which brings the quotations to $38 for Bessemer and $40 for open-hearth rail. In the meantime, there have been some slight reductions in the prices of track spikes and track bolts at Pittsburgh with every indication that further concessions will be made in any case where a large tonnage is offered. Thus, whereas $2.40 per 100 lb. is the current quotation for track spikes, it is said that a large order was recently awarded at $2.30. Track bolts in carloads are said to go as low as $3.25 at Pittsburg. Structural steel prices are also still on the decline.

	Price in Cents Per Pound			
	September 20		October 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	2.50	2.78	2.40	2.78
Track bolts	3.78	3.78	3.50	3.78
Angle bars	...	...	...	...
Tie plates, steel	2.00	2.00	2.00	2.00
Tie plates, iron	...	2.00	...	2.00
Plain wire	2.60	2.98	2.60	2.98
Wire nails	2.90	3.28	2.90	3.28
Barbed wire, gal.	3.55	3.93	3.55	3.93
C. I. pipe, 6 in. or larger, per ton	...	$44.10	...	$44.10
Plates	1.70	1.85	1.65	1.75
Shapes	1.75	1.85	1.65	1.75
Bars	1.70	1.90	1.60	1.75

The prices of scrap have advanced from $1 to $2 during the past month in spite of the fact that there is no appreciable demand for this material.

	Per Gross Ton	
	Chicago	St. Louis
Relaying rails	$27.50 to $30.00	$30.00 to $32.00
Rerolling rails	14.00 to 14.50	13.50 to 14.00
Rails less than 3 ft. long	14.00 to 14.50	13.00 to 13.50
Frogs and switches cut apart	13.00 to 13.50	12.00 to 12.50
	Per Net Ton	
No. 1 railroad wrought	13.50 to 14.00	12.00 to 12.50
Steel angle bars	12.00 to 12.50	11.00 to 11.50

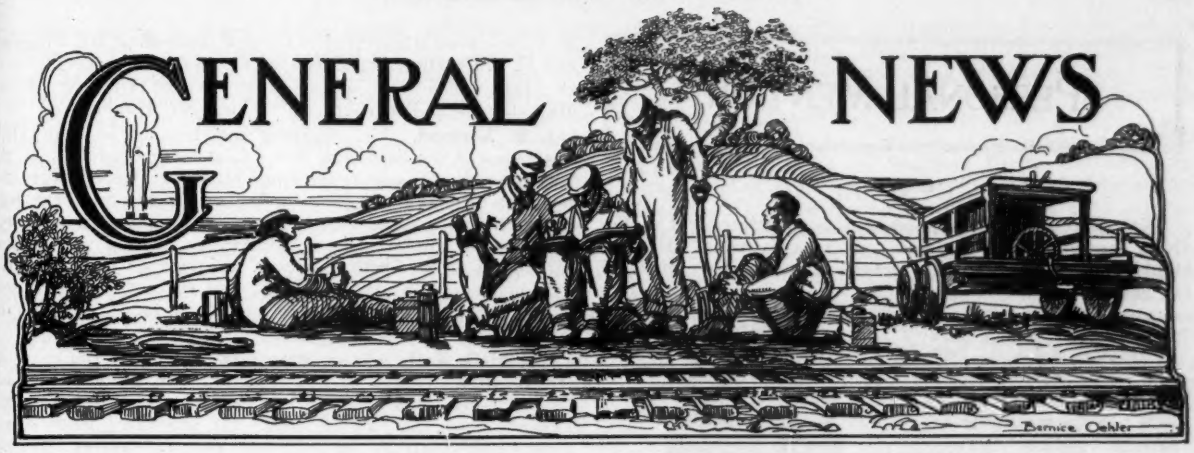
The lumber trade feels very much encouraged by the showing made during the last four to six weeks. Both the cut and shipment figures recorded by the National Lumber Manufacturers' Association for the month of September are appreciably above the normal figure for this time of the year and show a marked improvement over the month of July. The improvement is particularly noticeable in the case of the Southern pine mills, which do not suffer so seriously from the transportation handicap as the West Coast mills.

Southern Mill Prices	September	October
Flooring, 1 x 4, B. and B. flat	$34.30	$42.35
Boards, 1 x 8, 14 and 16, No. 1	23.65	25.45
Dimension, 2 x 4, 16, No. 1	18.90	22.30
Dimension, 2 x 10, 16, No. 1	20.50	20.40
Timbers, 4 x 4 to 8 x 8, No. 1	18.25	18.40
Timbers, 3 x 12 to 12 x 12, No. 1	21.90	22.55
Douglas Mill Prices		
Flooring, 1 x 4, No. 2, clear, flat	21.00	21.00
Boards, 1 x 6, 6 to 20, No. 1, common	9.50	10.50
Dimension, 2 x 4, 16, No. 1, common	11.00	11.50
Dimension, 2 x 10, 16, No. 1, common	11.00	11.50
Timbers, 6 x 6 to 8 x 8, No. 1, common	14.00	14.00
Timbers, 10 x 10 to 12 x 12, rough	13.00	14.00

No material has enjoyed as favorable a condition during the past year as Portland cement owing to the enormous quantities which are used in the construction of highways. Shipments of Portland cement during the third quarter of 1921 aggregate approximately 33,970,000 bbl., which is a record for that quarter of the year. This condition is also reflected in an approximate production in September of 10,000,000 bbl., a record for that month. In view of this condition, it is not at all surprising that the prices of this material hold up. The prices per barrel given below for carload lots show no change from the prices of a month ago except the case of Davenport, where there was a slight reduction:

Pittsburgh	$2.02	Milwaukee	$2.19
Detroit	2.31	Minneapolis	2.26
Chicago	1.97	Davenport	2.22
Duluth	1.95	Cincinnati	2.37

GENERAL NEWS



The Great Northern has applied for authority to abandon a 3½-mile line extending from Portland to Portland Junction, N. D.

A fire in the Chicago, Rock Island & Pacific terminal at Pratt, Kan., on October 7, destroyed the repair tracks, car sheds, carpenter shops and 25 box cars, causing an estimated loss of $200,000.

The Franklin & Pittsylvania, a road of 40 miles, has applied to the Interstate Commerce Commission for authority to abandon its line extending from Rocky Mount to Pittsville, Va., a distance of 30 miles.

The Railways of Spain have 6,773 miles and 243 miles, respectively, of single and double track of standard gage, 2,119 miles and 16 miles of single and double track of 5 ft. 6 in. gage and 8,886 miles and 260 miles of meter gage.

Mortimer Elwyn Cooley, dean of the College of Engineering and Architecture of the University of Michigan, was elected president of the American Engineering Council of the Federated American Engineering Societies at a meeting of the Executive Board of the council on September 30.

The Employee Stockholders of the Lehigh Valley now number 1,348, 6,482 shares having been purchased by employees in the last 14 months. In October, 1920, the per capita subscription to this stock was 4.36 shares, while in October of this year it was 4.80 shares.

The number of employees now in service with the Pennsylvania System is 199,000, 14,000 men having been hired since May 16. According to a statement given out by President Rea, it is the intention of the road to utilize the additional men chiefly in putting idle cars in serviceable shape for the coming winter.

Four men were killed and two were injured when a Canadian Pacific freight train was caught by falling rock in a tunnel one mile east of Palliser, B. C., on the night of October 20. Heavy rains had caused a movement on the mountain above the tunnel, resulting in a severe strain on the roof and sides of the tunnel and this is said to have caused the cave-in.

A railroad is not bound to provide railings on bridge approaches that will stop an automobile which runs into it, nor is the railroad considered negligible if this approach is constructed with a curve of 45 ft. radius. This is the decision of the Circuit Court of Appeals, Eighth Circuit, in an action against a railroad in a case where an automobile skidded and went through the railing of an approach to a highway bridge.

The Safety Section of the American Railway Association held its first meeting at the Hotel Copley-Plaza, Boston, on September 26. The subjects discussed included the recommendation of standard practices in use of proper end guards on the front of track motor cars, a proposed rule making compulsory the wearing of goggles by men doing work involving danger to the eyes and the use of whistles by track foremen for warning their men to clear all tracks when trains are approaching. The latter recommendation was not adopted, a question being raised as to whether the adoption of such a rule would have a tendency to increase the danger when the foremen are absent.

A national "Stop, Look and Listen" campaign is now under consideration by the Safety Section of the American Railroad Association. The plan proposed calls for a campaign covering a period of about three months at the time of the year when extensive touring is done, to be conducted jointly by all railroads in the country according to a plan whereby constant appeal will be made to the public through the press and the several automobile associations in the matter of crossing railway tracks.

Officers have been appointed by four of the railroads owning land on the South branch of the Chicago river to negotiate with the city of Chicago on the proposed straightening of the river. These officers are: E. T. Glennon, assistant vice-president, New York Central; L. C. Fritch, vice-president, Chicago, Rock Island & Pacific; W. J. Towne, chief engineer, Chicago & North Western, and G. P. Palmer, engineer of maintenance and construction, Baltimore & Ohio, Chicago Terminal. These officers will serve on a joint committee of city and railroad officers to be headed by E. J. Noonan, chief engineer and member of the Chicago Terminal Commission.

The explosion which wrecked the Chicago & North Western's grain elevator at Chicago on March 19, resulting in the death of six persons and a loss of $3,000,000, was caused by the detonation of dust ignited by an incipient fire in the driers. This is the conclusion reached by David J. Price, engineer in charge of development work, United States Department of Agriculture, as stated in a report he presented before the Western Society of Engineers on October 3. According to Mr. Price the danger from dust explosions in grain elevators cannot be overcome until facilities for aspiration or pneumatic dust collection are provided. The principal obstacles in the way of this are the regulations and statutes governing the handling of grain which prohibit the removal of the dust before the grain is taken into the elevator for weighing. Little progress will be made in the removal of the dust explosion hazard until these regulations are modified.

A conference on the proposed unification of specifications for railroad cross-ties and switch ties called by the American Engineering Standards Committee was held at Washington on October 25 at the office of the United States Forest Service. The conference decided unanimously that such unification should be undertaken, but it was thought best to confine the work to unifying the existing specifications as to size and quality and not to consider the matter of treating ties. The Forest Service and the American Railway Engineering Association were appointed sponsors for the organization of the work and committees will be formed, including representatives of the lumber industry and other interests. The National Lumber Manufacturers' Association is to communicate at once with its regional associations as to representation of the industry at future meetings. John Foley, forester of the Pennsylvania, represented the American Railway Engineering Association at the conference.

PERSONAL MENTION

GENERAL

Walt Dennis, whose appointment as superintendent of the New Jersey, Indiana & Illinois, with headquarters at South Bend, Ind., was noted in the October issue, has been engaged in engineering and maintenance of way work up to this time. He was born in Alliance, Ohio, in 1879 and graduated from Kansas State University in 1900. In the same year he entered railway service with the Kansas City Southern as an axeman and rodman in the maintenance of way department. During 1902 he was in the employ of Waddell & Hedrick, Kansas City, Mo., as a bridge draftsman and in 1903 went with the Kansas City, Mexico & Orient on location and construction. He was appointed chief delineator on double track and new construction work on the Union Pacific in 1904 and in 1906 became associated with Horace G. Burt, consulting engineer, on special reports in connection with grade reduction. He returned to the Kansas City Southern in 1907 as office engineer and in 1912 joined the engineering department of the Chicago, Rock Island & Pacific, serving successively as locating engineer, construction engineer, special engineer and assistant engineer on special investigations over the system until May, 1917, when he was appointed principal assistant engineer of the Wabash. Later he was engaged in war construction work at Richmond, Va., and returned to the Wabash in January, 1919, as division engineer of the Western division at Moberly, Mo., which position he held at the time of his recent appointment.

Walt Dennis

ENGINEERING

William Shingleton, assistant engineer on the Chicago, Indianapolis & Louisville, has resumed his position with that road at Lafayette, Ind., after a leave of absence of three months.

C. P. Richardson, assistant engineer of the Dakota division of the Chicago, Rock Island & Pacific, has been transferred to the general offices in Chicago, where he will be in charge of special work in the engineering department.

D. S. Watkins, engineer of construction of the Buffalo, Rochester & Pittsburgh, with headquarters at Du Bois, Pa., has resigned after service with this road in an official capacity for 25 years, for the last 15 years of which he has been engineer of construction. The position of engineer of construction has been abolished.

Z. A. Green, assistant engineer on the Gulf, Colorado & Santa Fe, with headquarters at Galveston, Tex., has been promoted to division engineer of the Galveston division, with the same headquarters, succeeding **W. W. Wilson,** who has been transferred to the Southern division, with headquarters at Temple, Tex., in place of **F. W. Leatherbury,** deceased.

H. S. Clarke, division engineer on the Delaware & Hudson, with headquarters at Carbondale, Pa., has been promoted to engineer maintenance of way, with headquarters at Albany, N. Y., succeeding **W. B. Leonard,** assigned to other duties. **H. S. Rogers,** division engineer, with headquarters at Oneonta, N. Y., has been transferred to Carbondale, succeeding Mr. Clarke. **G. D. Hughey,** division engineer at Plattsburg, N. Y., has been transferred to Oeonta succeeding Mr. Rogers, and **F. P. Gutelius, Jr.,** assistant engineer, with headquarters at Albany, has been promoted to division engineer, with headquarters at Plattsburg, succeeding Mr. Hughey.

J. S. Lemond, chief engineer maintenance of way and structures of the Southern, Lines East, with headquarters at Charlotte, N. C., will retire from active service on November 1 at the age of 70 after having served the Southern for 39 years. He will continue in service in an advisory capacity as assistant chief engineer maintenance of way and structures, and **J. B. Akers,** engineer maintenance of way with headquarters at Knoxville, Tenn., will succeed him as chief engineer maintenance of way and structures. **J. A. Killian** will succeed Mr. Akers.

Harold O. Kelly, whose promotion to division engineer of the Western division of the Wabash, with headquarters at Moberly, Mo., was noted in last month's issue, was born at Lebanon, Ind., on July 17, 1890. He graduated from Rose Polytechnic Institute in 1913 and entered railway service with the Chicago & Eastern Illinois in the same year as assistant in the engineering corps. From 1916 to 1918 Mr. Kelly served as engineer maintenance of way of the Evansville & Indianapolis and in 1919 went with the Wabash as assistant engineer. In December of the same year he was promoted to division engineer and in April, 1920, was appointed special engineer, the position he held at the time of his recent promotion.

W. R. Bennett, whose promotion to assistant engineer on the Wabash, with headquarters at St. Louis, was noted in the October issue, was born at Peoria, Ill., on June 28, 1888. He received his education at Bradley Polytechnic Institute and entered the service of the Chicago & Alton in July, 1908, as a transitman on track elevation work at Joliet. In May, 1909, he became associated with the Peoria & Pekin Union as transitman and in April, 1910, was appointed inspector on the construction of a new bridge across the Illinois river. He was promoted to assistant engineer on bridge construction in May, 1911. From February, 1913, to November, 1914, Mr. Bennett served as assistant city engineer of Peoria, Ill., and on the latter date entered the service of the Atchison, Topeka & Santa Fe as a draftsman at Topeka, Kan. He was appointed transitman in March, 1915, and in November, 1915, became a draftsman on federal valuation at Topeka, Kan. From April, 1916, to October, 1918, he served successively as construction inspector, transitman, engineer accountant, assistant chief clerk to the superintendent and valuation accountant, and was appointed assistant division engineer of the Detroit division of the Wabash on the latter date. In November, 1919, he was appointed track supervisor, and from April, 1921, to October, 1921, served as roadmaster of the Chicago Terminal division, which position he held at the time of his recent promotion.

H. R. Clarke, general roadmaster on the Chicago, Burlington & Quincy, with headquarters at McCook, Neb., has been appointed district engineer maintenance of way for the Nebraska district, with headquarters at Lincoln, Neb., and **R. C. Pearson** has been appointed district engineer maintenance of way for the Wyoming district, with headquarters at Alliance, Neb. **Arthur Craine,** assistant engineer, with headquarters at St. Joseph, Mo., has been appointed district engineer maintenance of way of the Missouri district, with headquarters at St. Louis, Mo., these positions having been recently created.

E. F. Kultchar, trainmaster on the Chicago, Burlington & Quincy, with headquarters at St. Joseph, Mo., has been appointed district engineer maintenance of way of the Illinois district, with headquarters at Galesburg, Ill., a newly created position. Mr. Kultchar was born in Chicago in 1885 and received his education at the University of Illinois. In 1903 he entered the employ of the Chicago, Burlington & Quincy as a rodman. In 1916 he was promoted to division engineer and in March, 1916, was appointed roadmaster, which position he held until June, 1917, when he was appointed trainmaster, the position he occupied at the time of his recent appointment.

D. Cameron, assistant general inspector permanent way and structures on the Chicago, Burlington & Quincy, with headquarters at Chicago, has been appointed district engineer

maintenance of way of the Iowa district, with headquarters at Burlington, Iowa, a newly created position. Mr. Cameron was born at Aberdeen, Scotland, on August 26, 1884. He received his education at the Robert Gordon's College in Aberdeen and in 1902 went to work for Walker & Duncan, engineers and architects in Aberdeen. In 1908 he came to America and on September 27, 1909, entered railway service with the Chicago, Burlington & Quincy as a rodman. In June, 1911, he was made instrumentman and two years later became draftsman. In July, 1915, Mr. Cameron was promoted to assistant engineer and in March, 1917, was assigned to work on the construction of a new yard at Clyde, Ill., where he remained until November, 1918, when he was appointed roadmaster, with headquarters at Chicago. Later he was appointed assistant general inspector permanent way and structures, the position he held at the time of his recent appointment.

TRACK

Geo. E. Lowe, assistant roadmaster on the Delaware, Lackawanna & Western, with headquarters at Elmira, N. Y., has been promoted to roadmaster, succeeding **James Wynne,** retired.

R. Vawter, assistant supervisor of track on the Chesapeake & Ohio, with headquarters at West Hamlin, W. Va., has been promoted to supervisor of track, with headquarters at Cane Fork, W. Va., succeeding **B. Jackson,** transferred to the Whitesville district, with headquarters at St. Albans, W. Va., succeeding **L. Rosemire,** transferred. **S. V. Rousey** has been appointed assistant supervisor of track, with headquarters at West Hamlin, W. Va., succeeding Mr. Vawter.

Smith N. Crowe, whose appointment to the position of supervisor on the Wabash, with headquarters at Montpelier, Ohio, was noted in the October issue, was born at Richmond, Ind., on November 1, 1889. He received his education at Rose Polytechnic Institute and entered railway service with the Pittsburgh, Cincinnati, Chicago & St. Louis in February, 1916, as an assistant in the engineering corps. He was promoted to assistant engineer in June, 1919, and held this position until his recent appointment to the position of supervisor.

Arthur F. Carlson has been promoted to roadmaster on the Northern division of the Chicago, Milwaukee & St. Paul, with headquarters at Horicon, Wis., succeeding **R. Whitty,** deceased. Mr. Carlson was born at Lake City, Minn., on October 13, 1891, and entered railway service with the Chicago, Milwaukee & St. Paul as a waterboy, later serving as laborer, flagman, assistant extra gang foreman and timekeeper, and in various other capacities until he was appointed section foreman in May, 1914, which position he held at the time of his promotion.

H. L. Bell, whose promotion to roadmaster of the Lufkin district of the Southern Pacific, with headquarters at Lufkin, Tex., was announced in the October issue, was born at Piedmont, Okla., in July, 1894, and studied civil engineering at Rice Institute, from which he was graduated in 1919. He entered railroad service as a cost data estimator in the valuation department of the Southern Pacific immediately after his graduation and in 1920 was promoted to assistant division engineer of the Shreveport division, which position he held until his recent appointment.

John Henberger has been appointed roadmaster on the Kansas City division of the Chicago, Milwaukee & St. Paul, with headquarters at Ottumwa, Iowa. Mr. Henberger was born in Germany in 1876 and entered railway service with the Atchison, Topeka & Santa Fe in 1892 at a station helper. From September, 1894, until November, 1903, he served as track laborer and section foreman and at the latter date left railroad work. He returned to the Atchison, Topeka & Santa Fe in March, 1905, as an extra gang foreman and in September, 1908, was promoted to division roadmaster. From November, 1916, to April, 1917, Mr. Henberger served as yard foreman and extra gang foreman and in April, 1917, was appointed general yard foreman on the Elgin, Joliet & Eastern. He returned to the Santa Fe in March, 1918, as division roadmaster, which position he held until February, 1921, when he was appointed tie inspector on the Elgin, Joliet & Eastern. From March, 1921, to July, 1921, he occupied the position of section and extra gang foreman on the Chicago, Milwaukee & St. Paul, and at the latter date was promoted to division roadmaster.

J. H. Williams, whose promotion to roadmaster of the Shreveport division of the Southern Pacific was announced in the October issue, was born in the State of Mississippi in January, 1883. He entered railway service as a laborer on a bridge gang on October 2, 1906, and was thus employed until 1912 when he was appointed bridge gang foreman. In the following year he was appointed foreman of a carpenter gang and in 1914 was employed as foreman of a concrete gang. On March 1, 1914, Mr. Williams was appointed section foreman, which position he held until February 23, 1921, when he was promoted to acting roadmaster on the First division, the position he held at the time of his recent promotion.

BRIDGES AND BUILDINGS

J. F. Lockwood, assistant supervisor of bridges and buildings on the Chesapeake & Ohio, with headquarters at Covington, Ky., has been promoted to general inspector of bridges, with headquarters at Richmond, Va., succeeding **C. E. Powell,** deceased. His jurisdiction will extend over the entire system, including that formerly under the jurisdiction of **J. M. Staten,** deceased. **E. N. Bishop,** extra force foreman, has been promoted to assistant supervisor of bridges and buildings to fill the vacancy left by Mr. Lockwood.

PURCHASING AND STORES

A. Singleton has been appointed purchasing agent and general storekeeper of the Hocking Valley, with headquarters at Columbus, Ohio, succeeding **J. R. Mueller,** purchasing agent, and **Leon Stiers,** general storekeeper, both of whom have been assigned to other duties.

J. D. McCarthy, whose appointment as purchasing agent of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., was noted in the October issue, was born on August 26, 1881, at Chicago. He entered railway service in 1899 as a roadmaster's clerk on the Chicago Great Western, serving successively until 1904 as chief clerk to the division engineer and the division storekeeper. From 1904 to 1906 he served in the accounting department of the Chicago, Rock Island & Pacific. In 1906 Mr. McCarthy entered the service of the Chicago & North Western and after serving in various capacities became assistant purchasing agent of that company, which position he held at the time of his recent appointment.

OBITUARY

James S. Browne, assistant to engineer maintenance of way of the New York, New Haven & Hartford, with headquarters at New Haven, Conn., died at his home in Providence, R. I., on October 22.

Captain Charles Wanzer, former railroad engineer, died at his ranch near Portland, Ore., on September 18, at the age of 75. Captain Wanzer was at one time confidential adviser and consulting engineer with A. H. Mohler on the Minneapolis & St. Louis and later on the Union Pacific System, prior to which time he was employed in the United States engineering service and was one of the engineers who built the old Wisconsin Central Railway, now a part of the St. P. M. & S. Ste. M.

F. F. Busteed, formerly general superintendent of the Canadian Pacific, and at one time assistant chief engineer, died suddenly from heart disease at his home in Vancouver, B. C., on October 2. He was born at Battery Point, Que., in 1858 and entered the service of the Canadian Pacific in 1879, serving in various capacities until his promotion to assistant chief engineer in June, 1904. He was promoted to general superintendent of the British Columbia division in 1907 and in 1911 was transferred to the Manitoba division. He re-entered the engineering department the same year in

charge of double tracking and grade revision from Calgary to the coast, which included the construction of the Connaught tunnel through the Selkirk mountains. Mr. Busteed retired in 1918.

J. D. Hawks, formerly president and general manager of the Detroit & Mackinac, who died on September 20 at Gloucester, Mass., spent most of his life in maintenance of way work. He was born at Buffalo, N. Y., on October 13, 1847, and received an engineering education at the University of Michigan. He entered railway service in 1870 as an assistant engineer on the Lake Shore & Michigan Southern, being transferred to the Erie division in 1875 and to the Lake Shore division in 1878. In 1881 Mr. Hawks became superintendent of construction of the New York, West Shore & Buffalo, now a part of the New York Central, and in 1883 was appointed engineer of maintenance of way. In 1884 he was appointed chief engineer of the Michigan Central, which position he held until 1892 when he became general manager of the Detroit Citizens' Street Railway. In the following year he became manager of the Detroit, Bay City & Alpena, now the Detroit & Mackinac, and was elected vice-president and general manager of the same road in 1895. He became president in 1896 and served continuously in that position until his retirement in 1920.

J. D. Hawks

Michael Burke, formerly roadmaster of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, and president of the Roadmasters' and Maintenance of Way Association in 1917, died suddenly on October 10. Mr. Burke was born in Ireland in 1864 and came to this country with his parents in 1868. He entered the employ of the Pennsylvania in 1877 as a waterboy, later serving as construction foreman on the Wisconsin Central. He was promoted a roadmaster in 1885 and shortly afterward left the Wisconsin Central to participate in railroad construction work in Colorado. He was appointed roadmaster on the Missouri, Kansas & Texas in 1895 and in 1899 entered the employ of the Chicago, Milwaukee & St. Paul, on which he was engaged as foreman on various track construction projects until his promotion to roadmaster in the Chicago terminals. Mr. Burke was general foreman in the Chicago terminals at the time of his death.

Michael Burke

Joseph M. Staten, general inspector of bridges on the Chesapeake & Ohio, with headquarters at Richmond, Va., died at his home in that city on October 2. Mr. Staten was born at Campbellsburg, Ky., on October 13, 1851, and at the age of 18 years entered railway service with the Louisville & Nashville. He later left that road and entered the service of the Chesapeake & Ohio, where, after serving in various capacities, he was promoted to general inspector of bridges, which position he has held for the past 32 years.

CONSTRUCTION NEWS

The Atchison, Topeka & Santa Fe will construct a warehouse and the necessary trackage leading to it, on its waterfront property at Stockton, Cal., at an estimated cost of $99,000. The same company will install a 55,000-gal. oil tank with necessary facilities for fueling oil-burning locomotives at Clovis, N. M., to cost about $40,000. Trackage will be constructed by the Santa Fe at a cost of $32,000, to a large coal mine at Radley, Kan.

This company also contemplates the erection of a hospital at Albuquerque, N. M., to cost approximately $300,000, and will construct additional yard tracks at Chillicothe, Ill., at a cost of about $51,000. The same company will also construct an interchange track in connection with the Sand Springs Railway, at Tulsa, Okla., and will construct several extensions to its machine shops at San Bernardino, Cal., at an estimated cost of $224,000. The work will include a boiler washing plant.

The same company will construct an industry track at Dallas, Tex., to cost about $21,000; a blow-off line in the roundhouse at Cleburn, Tex., and a similar one in its roundhouse at Temple, Tex., to cost about $11,000 each. A dike for protection against floods will be constructed in the rear of its engine house at La Junta, Colo., estimated to cost about $17,000; and a similar protection against floods will be constructed at Canadian, Tex., to cost about $25,000.

The Atlantic Coast Line has awarded a contract to R. N. McEachern, Moultrie, Ga., for the construction of a one-story brick freight warehouse, 36 ft. by 188 ft., and a cotton shed, 36 ft. by 378 ft., at Bishopville, S. C.

The Canadian Pacific has awarded a contract to Angus and Taylor, North Bay, Ontario, for the construction of a 68-mile extension from Kipawa, Quebec, to Desquinze, and eight miles into Villa Marie on Lake Temiskaming, the work to cost about $3,500,000.

The Chesapeake & Ohio has commenced work on a new brick and concrete freight station at Logan, W. Va. This station will be 33 ft. wide by 200 ft. long and will have an adjoining 220-ft. transfer platform. This company is also planning a new station layout at the same place to include a 35-ft. by 100-ft. passenger station and a 35-ft. by 100-ft. baggage and express building, both of brick and concrete construction. An extensive system of covered concrete platforms will also be included in the layout. The road is also contemplating the extension of the present engine house at Peach Creek, W. Va., to include five additional stalls, the installation of a new 100-ft. turntable and the revision of the supporting yard to include 10 additional tracks, new machine, forge and pipe shops, a coaling station, inspection pits, cinder conveyors and other miscellaneous facilities.

This company has awarded a contract to J. J. Craig, Covington, Ky., for the construction of a passenger station, 135 ft. by 38 ft., at Covington.

The Chicago, Burlington & Quincy has awarded a contract to the Link Belt Company, Chicago, for a 400-ton coaling station to be erected at Centralia, Ill., and has awarded a contract for the construction of a ten-stall brick roundhouse and a 100-ft. turntable at the same point to Jos. E. Nelson & Sons, Chicago.

The Chicago & Northwestern has awarded a contract for the construction of a spur track 1½ miles in length at Consol, Iowa, to John Marsch, Chicago, and has awarded a contract to White & Duffy, Milwaukee, Wis., for the construction of a subway at Fourth street, Clinton, Iowa, to cost about $100,000.

The Chicago, Rock Island & Pacific contemplates the erection of a storehouse and oil house at Amarillo, Tex., the estimated cost of which is $10,000. This company will replace the store house at Pratt, Kansas, which was destroyed by fire on October 6 with a total property loss estimated at $20,000.

The Chicago Union Station Company, which was noted in the October issue as accepting bids for the substructure for a viaduct at Madison street, Chicago, has awarded a contract for this work to the Underground Construction Company, Chicago. The station company has also awarded a contract to George P. Cullen, Chicago, for the structural work in widening Canal street, between Jackson boulevard and Van Buren street.

The Grand Trunk has undertaken the construction of a subway with concrete abutments and steel span at Yonge street, Aurora, Ontario, and has awarded the contract for the steel work to the Hamilton Bridge Works, Hamilton, Ont. The erection will be handled by company forces.

The Illinois Central has applied to the war department for permission to double-track its bridge across the Ohio river at Cairo, Ill. This work will cost about $8,500,000. This company will reconstruct its depot at Marissa, Ill., which was recently destroyed by fire, the cost of which will approximate $10,000, and has awarded a contract for the construction of a section foreman's house and three section labor housing buildings at Clinton, Ill., to Joseph E. Nelson & Sons, Chicago. The latter work will cost about $12,000.

The Jacksonville Terminal Company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the erection of an electric cinder conveyor at Jacksonville, Fla.

The Kansas City, Mexico & Orient, in conjunction with the National Railways of Mexico, contemplates the construction of an international bridge spanning the Rio Grande between Del Rio, Tex., and Las Varas, Mex.

The Kansas & Oklahoma has applied to the Interstate Commerce Commission for authority to complete the construction of a line of 65 miles from Caney, Kan., to Vinita, Okla., of which the first 37 miles was built some time ago.

The Kansas City Southern contemplates the construction of a bridge across the Arkansas river below Ft. Smith, Ark.

The Los Angeles & Salt Lake plans extensions to its lines from Whittier to Santa Ana, a distance of 14 miles, and from Whittier to Tustin, a distance of 22 miles, both in Orange County, Cal. The work, as estimated, will cost between $1,500,000 and $2,000,000.

The Los Angeles & Salt Lake has applied to the Interstate Commerce Commission for certificates authorizing an extension of its Santa Ana branch in California for a distance of 14 miles, and also for a new line extending from its branch from La Habra east and south to Tustin, Orange County, 21.8 miles.

The McClellansville & Santee has applied to the Interstate Commerce Commission for authority to construct a 20-mile line from Jamestown to McClellansville, S. C.

The Missouri Pacific has awarded a contract to Joseph E. Nelson & Sons, Chicago, for five pumping stations and water treating plants to be erected at Alexandria, La., Annapolis, Mo., Hoxie, Ark., McGehee, Ark., and Van Buren, Ark., to cost approximately $135,000.

The Missouri Pacific contemplates the construction of about 25 miles of second main track on its line between St. Louis, Mo., and Jefferson City, at an estimated cost of $2,000,000. Bids will be requested for either the whole or part of this work when surveys have been completed. This same company will soon request bids for the construction of two car repair sheds, 46 ft. by 500 ft., at St. Louis, at an estimated cost of $80,000; one car repair shed at Kansas City, Mo., 120 ft. by 500 ft., to cost $82,000; and a 70 ft. by 200 ft. addition to its present sheds at Sedalia, Mo., which will cost about $31,500.

The New York Central has awarded a contract to the Roberts and Schaefer Company, Chicago, for the installation of an electric cinder conveyor at Wayneport, N. Y.

The Northern Pacific has awarded a contract to H. C. Struchen, St. Paul, Minn., for the construction of a steel bridge over Trout creek, about 30 miles west of Missoula, Mont. This bridge is a single track structure, 238 ft. long and 45 ft. high, consisting of a 145-ft. pin connected deck truss with approach spans 40 and 50 ft. long at the ends.

The Oklahoma & Arkansas has received a certificate from the Interstate Commerce Commission authorizing the construction of a line from an intersection with the Kansas, Oklahoma & Gulf near Salina, Okla., in a generally easterly direction for approximately 20 miles, and has awarded a contract for its construction to J. W. Hoffman, Kansas City, Mo. The right-of-way is now being acquired and construction work will begin about October 1.

The Oregon-Washington, in conjunction with the city of Seattle, Wash., and other railroads entering that city, contemplates the construction of a permanent bridge across the Seattle freight yards.

The Philadelphia & Reading has awarded a contract to F. W. Van Loon, Philadelphia, for the construction of a freight house and office building at Coatesville, Pa. The office building will be 22 ft. by 40 ft. and will include an extension 30 ft. by 98 ft. to be built for office use over the freight house. The work will be of brick supported on steel and concrete foundations. The freight house will be 196 ft. long with a platform 10 ft. wide on the track side and an open platform 31 ft. by 38 ft.

The Pittsburgh & West Virginia has awarded a contract for a 150-ton, two-track, concrete coaling station with sand storage, drying, elevating and delivery equipment at Avella, Pa., to the Ogle Construction Company, Chicago.

The Quebec Extension Company, of which A. R. Gould, Presque Isle, Me., is president, is contemplating the construction of a line from Washburn, Me., to Frontier Lake, Quebec. This company has 12 miles of road in operation at the present time and will probably begin active work on the new line next season. The work will involve the construction of two steel bridges, 500 ft. and 600 ft. in length, and a number of trestles.

The San Antonio & Aransas Pass contemplates the construction of a hollow tile passenger depot at Taft, Tex., to cost about $11,000, and a hollow tile combination freight and passenger depot at Poth, Tex., to cost about $8,300.

The Sewell Valley is contemplating the erection of a shop building at Rainelle, W. Va., to have an erecting aisle approximately 60 ft. by 120 ft., and a machinery aisle 30 ft. by 120 ft., to be equipped with an electric crane of 25 or 30 tons capacity in the main erecting aisle.

The St. Louis-San Francisco has received bids for the construction of a one-story station, 24 ft. by 106 ft., at St. Clair, Mo., and also for bids covering the construction of a coaling station at Newburg, Mo.

The Southern Pacific has started the construction of a 420-ft. extension to the grain elevator gallery of its Sunset elevator on Pier "A" at Galveston, Tex., equipping this gallery with a 36-in. belt. The work will be done by company forces, and the entire cost of the work is estimated at $41,000.

The Temiskaming & Northern Ontario will soon commence work on a 70-mile $3,500,000 extension, northward from Cochrane to Smoky Falls.

The Texas & Pacific, which was noted in the October issue as accepting bids for the construction of a new passenger station at Ranger, Tex., has awarded the contract for this work to Henger & Chambers Company, Dallas, Tex.

The Uintah has obtained authority from the Interstate Commerce Commission to construct extensions to its lines totaling 25 miles.

EQUIPMENT AND SUPPLIES

Mitsui & Company, New York, is inquiring for about 1,700 tons of 75-lb. rail and accessories and an alternative of 1,400 tons of 60-lb. rail for export to Japan.

The New York Central will receive bids until November 4 for its present requirements of manganese frogs and other equipment.

The St. Louis Southwestern is inquiring for 10,000 tons of rails for delivery in 1922.

The Wabash is inquiring for 325 tons of steel for a bridge at Attica, Ind.

SUPPLY TRADE NEWS

GENERAL

The Lakewood Engineering Company, Cleveland, Ohio, has moved its Philadelphia office from the Widener building to the Franklin Trust building.

The Chain Belt Company, Milwaukee, Wis., has appointed the Superior Supply Company, Chicago, exclusive railway distributor of the Rex concrete mixers.

The Westinghouse Electric & Manufacturing Company will establish a branch office at 316 Thirteenth street, Huntington, W. Va., of which D. B. Clark will take charge.

The Austin Machinery Corporation has established the Canadian Austin Machinery, Limited, Woodstock, Ont., for the purpose of manufacturing and distributing the Austin equipment in Canada.

The H. K. Ferguson Company, Cleveland, Ohio, has taken over the exclusive sales rights for the Shoemaker gap crane and other products of the Morgan Engineering Company, Alliance, Ohio, in the railway field.

The Independent Pneumatic Tool Company, Chicago, has moved its branch office at Toronto, Ont., from 32 Front street West, to larger quarters at 163 Dufferin street, Toronto. This office remains under the control of **William McCrae.**

The Superior Supply Company, Chicago, has been appointed the direct factory representative of the Novo Engine Company, Lansing, Mich., and will handle the sale of the Novo line of portable power-driven outfits, including pumps, hoists, compressors, saw rigs, etc.

The Inland Steel Company is making arrangements to manufacture steel rails at its Indiana Harbor works and will be in a position to offer standard section rails for delivery beginning in March, 1922. Work has been started on a new building, 100 ft. by 800 ft., at the Indiana Harbor works of the company, in which the rail finishing equipment will be housed. The entire plant will have a capacity of 2,000 tons of finished rails daily.

The Pullman Company and **Haskell & Barker** will combine, according to a rumor at Chicago. It is reported that the officers of the two companies involved have already discussed the plan of organization informally and that John S. Runnels, president of the Pullman Company, is to become chairman of the board of directors of the new company, and Edward F. Carry, president of Haskell & Barker, is to become president.

The firm of Stovel & Brinkerhoff, with offices at 136 Liberty street, New York City, was recently organized by R. W. Stovel and H. A. Brinkerhoff to engage in engineering and contracting work. Mr. Stovel was educated at McGill University, from which he was graduated as an electrical engineer in 1897. He served on the Pittsburgh & Lake Erie for five years, following his graduation, after which he entered the employ of Westinghouse, Church, Kerr & Company, serving in various positions, including those of mechanical engineer and managing engineer, until 1914. From 1914 to 1917 he was employed by Gibbs & Hill, having charge of the Pennsylvania electrification and construction during a portion of this period. From 1917 to 1919, as a lieutenant-colonel, he had charge of mechanic and electric equipment in military service, following which he re-entered the employ of Westinghouse, Church, Kerr & Company and its successor, the Dwight P. Robinson Company. Mr. Brinkerhoff was in the service of the C. & D. Electrical Company until 1897, when he entered the employ of Westinghouse, Church, Kerr & Company, with whom he was general superintendent of construction in charge of mechanical and electrical installations at the Pennsylvania station, New York, and was also in charge of numerous other engineering and construction projects. After the merging of Westinghouse, Church, Kerr & Company with Dwight P. Robinson & Company in 1920, Mr. Brinkerhoff served as industrial engineer in charge of the industrial engineering division.

PERSONAL

E. E. Aldous has been appointed representative of the American Steel & Wire Company in the St. Paul, Minneapolis and Duluth territory, with headquarters at St. Paul, Minn.

William C. Wolfe has been appointed manager of sales of the Highland Iron & Steel Company, Terre Haute, Ind., a subsidiary of the American Chain Company. Mr. Wolfe's headquarters will be at 208 South La Salle street, Chicago.

James A. Slater, manager of sales of the National Malleable Castings Company, Chicago, has been appointed assistant sales manager, with headquarters at Cleveland, Ohio, to succeed **J. A. Redhead,** resigned to become manager of the Reliance Company, Cleveland, as noted elsewhere.

George L. Sawyer, formerly sales manager of material handling machinery for the Barber-Greene Company, Aurora, Ill., has been appointed sales representative for the Universal Crane Company of Elyria, Ohio, in charge of the New York territory, with headquarters at the allied machinery center, New York City, N. Y.

W. E. Kelly has been appointed representative of the Handlan-Buck Manufacturing Company, St. Louis, Mo., for Chicago and adjacent territory, with headquarters in the McCormick building, Chicago, in addition to serving as western representative of the Central Railway Signal Company.

H. O. Davidson has been given entire charge of the Prudential sectional building department of the Blaw-Knox Company, with headquarters at Baltimore, Md. He will also serve as general manager of the C. D. Pruden plant of the Blaw-Knox Company. Previous to his appointment Mr. Davidson was general manager of the Hydraulic Steelcraft Company.

J. H. Redhead, assistant manager of sales of the National Malleable Castings Company, has resigned to become manager of the Reliance Company, Cleveland, Ohio, which firm has recently been organized by the Reliance Trust Company in conjunction with its affiliated companies, the Reliance Savings and Loan Company and the Reliance Securities Company, the larger of which are engaged in various banking and investment activities.

Henry J. Kimman, who has been manager of the Cleveland plant of the Chicago Pneumatic Tool Company since 1902, died in Cleveland, Ohio, on September 7. Mr. Kimman was born in Holland in 1863 and came to America with his parents in 1870. He served an apprenticeship with the Adams & Westlake Company and was also employed by other manufacturing concerns in Chicago and in the far West. In collaboration with his brother, T. P. Kimman, he developed and manufactured the first practical portable piston air drill. He became associated with E. N. Hurley in 1898 in the formation of the Standard Pneumatic Tool Company and with the Chicago Pneumatic Tool Company in the consolidation of pneumatic tool interests in 1901, at which time he became manager of the Cleveland plant of the Chicago company. He remained in active charge of the plant until his death.

TRADE PUBLICATIONS

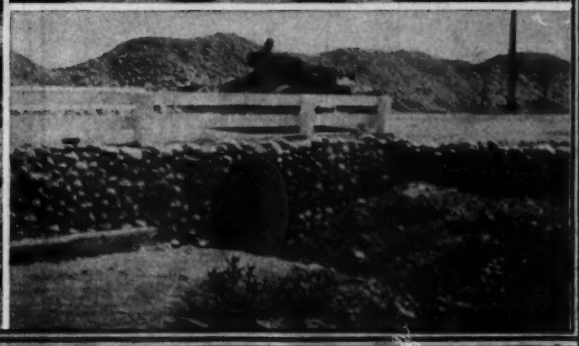
Cutting the Unreckoned Costs.—A ten-page illustrated booklet has been issued recently by R. D. Skinner & Co., Inc., New York, descriptive of the belting manufactured by that company. The text discusses the various features of the belt, such as the special weave, the internal lubrication and the results which have attained in numerous competitive tests with other types of belting.

Metal Spraying.—The Metals Coating Company of America, Philadelphia, Pa., has issued a 16-page, illustrated booklet descriptive of the metal spraying device manufactured by that company. The process of coating various materials with metals in order to secure non-corrosive surface as well as the mechanical construction of the apparatus are explained in detail. In addition, another type of apparatus for the application of a coating at a higher rate for large flat surfaces by the use of metal dust is described. The illustrations show the different classes of work which can be performed and the construction of the apparatus.

Replacing the Small Bridge with Culverts

A recent letter sent highway officials in many states brought forth some surprising statements relative to the number of small bridges which were installed some years ago and which today are totally inadequate for the heavy loads they are compelled to carry. Over 25,000 small bridges in one state were pronounced unsafe for anything heavier than pleasure vehicles and ordinary wagon loads. Many of the bridge engineers commented on the weakness of small bridges in their states and pointed out the advisability and necessity of replacing floor boards and strengthening stringers to prevent failures and possible serious accidents. The constant maintenance and repair of small bridges takes labor, material, and money which can be diverted to new construction and road maintenance when a better method of bridging small waterways is used.

The illustrations on this page indicate how some highway and bridge officials have successfully replaced the troublesome small bridge. One, two, or more Armco Culverts are placed in the channel and head walls of concrete or rubble are constructed at the ends of the culverts. The space between the head walls is then filled and the regular road surface extended across the fill. No maintenance or repairing is required other than the regular maintenance of the road surface. The permanence of such construction has been amply demonstrated by hundreds of culvert installations which were made ten or more years ago and which are in perfect condition today.



STATEMENT of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of the *Railway Maintenance Engineer*, published monthly at Chicago, Ill., for October 1, 1921.

State of New York } ss.
County of New York }

Before me, a notary public in and for the State and County aforesaid, personally appeared Edward A. Simmons, who, having been duly sworn according to law, deposes and says that he is the President of the Simmons-Boardman Publishing Company, publisher of the *Railway Maintenance Engineer*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Simmons-Boardman Publishing Co., Transportation Building, Chicago, Ill.

Editor, Elmer T. Howson, Transportation Building, Chicago, Ill.

Managing Editor, W. S. Lacher, Transportation Building, Chicago, Ill.

Business Manager—None.

2. That the owners are:

Owner — Simmons - Boardman Publishing Co., Woolworth Building, New York, N. Y. Stockholders holding 1 per cent or more of total amount of stock: Edward A. Simmons, Woolworth Building, New York; Lucius B. Sherman, Transportation Building, Chicago, Ill.; Henry Lee, Woolworth Building, New York; Samuel O. Dunn, Transportation Building, Chicago, Ill.; Roy V. Wright, Woolworth Building, New York; Elmer T. Howson, Transportation Building, Chicago, Ill.; Frederick H. Thompson, 4300 Euclid Avenue, Cleveland, O.; Thomas Prosser & Son, P. O. Box 878, New York, N. Y.; Herbert L. Aldrich, 50 Central Park West, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reaon to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDWARD A. SIMMONS.

[SEAL]

Sworn to and subscribed before me this twenty-ninth day of September, 1921.

HERBERT E. McCANDLESS.
(My commission expires March 30, 1922)